MZ-R5ST

SERVICE MANUAL

Tourist Model

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Model Name Using Similar Mechanism	MZ-R50
Mini Disc Mechanism Type	MT-MZR50-143
Optical Pick-up Type	KMS-280A/J2N

SPECIFICATIONS

System

Audio playing system	MiniDisc digital audio system
Laser diode properties	Material: GaAlAs Wavelength: λ = 780 nm Emission duration : continuous Laser output : less than 44.6 mW This output is the value measured at a distance of 200 mm from the objective lens surface on the optical pick-up block with 7 mm aperture.
Recording and playback time	
	Maximum 74 minutes (MDW-74, stereo recording)
	Maximum 148 minutes (MDW-74, monaural recording)
Revolutions	400 rpm to 900 rpm (CLV)
Error correction	Advanced Cross Interleave Reed Solomon Code (ACIRC)
Sampling frequency	44.1 kHz
Coding	Adaptive TRansform Acoustic Coding (ATRAC)
Modulation system	EFM (Eight to Fourteen Modulation)
Number of channels	2 stereo channels 1 monaural channel
Wow and Flutter	Below measurable limit

Recorder

Frequency response	20 to 20,000 Hz ± 3 dB
Input	MIC (PLUG IN POWER): stereo mini-jack, 0.22 to 0.78 mV
Output	🎧/REMOTE: stereo mini-jack, maximum output level 5 mW + 5 mW, load impedance 16 Ω

Station

Frequency response	5 to 20,000 Hz ± 0.5 dB
Input	LINE (ANALOG) IN: phono jack, rated input level 500 mV
	DIGITAL IN OPT1, OPT2: rectangular-shaped optical plug, wavelength 660 nm
Output	LINE (ANALOG) IN: phono jack, rated output level 500 mV, load impedance 10 kilohms or greater
	ACTIVE SP OUT: stereo minijack, rated output level 500 mV, load impedance 4.7 kilohms or greater
	DIGITAL OUT: rectangular-shaped optical plug, output level -17 dBm, wavelength 660 nm

— Continued on next page —

PORTABLE MINI DISC RECORDER

MICROFILM

SONY®

🎧 HEADPHONES: stereo phone jack, peak output level 5 mW + 5 mW, load impedance 16 Ω

Sampling rate converter

Input: 32 kHz/44.1 kHz/48 kHz
Output: 44.1 kHz

General

Power requirements
Recorder:

Lithium ion rechargeable battery LIP-8 (supplied)
Two LR6 (size AA) alkaline dry batteries (not supplied)

Station:

Sony AC power adaptor (supplied) connected to the DC IN 9V jack:
220 to 230 V AC, 50/60 Hz (European model)
100 to 240 V AC, 50/60 Hz (Other models)

Battery life

For longer recordings, we recommend using the recorder attached to the station.

Batteries	Recording[2)]	Playback
LIP-8 lithium ion rechargeable battery	Approx. 3.5 hours	Approx. 5.5 hours
Two LR6 (size AA) Sony alkaline dry batteries	----- [3)]	Approx. 9 hours
LIP– 8 + two LR6 (size AA)	----- [3)]	Approx. 16 hours

1) The battery life may be shorter due to operating conditions and the temperature of the location.
2) When you record, use a fully charged rechageable battery.
3) Recording time may differ according to the alkaline batteries.

When to replace the batteries

When the dry batteries or rechargeable battery are weak, ▭ or "LoBATT" flashes in the display of the recorder or the remote control. Replace the dry batteries or charge the rechargeable battery.

Dimensions

Recorder: Approx. 104.5 × 20.1 × 77 mm (4 1/8 × 13/16 x 3 1/8 in.)
Station: Approx. 232 × 61 × 154 mm (9 1/4 × 2 1/2 × 6 1/8 in.) (w/h/d) not incl. projecting parts and controls

Mass

Recorder: Approx. 185 g (6.6 oz)
Approx. 235 g (8.3 oz.) incl. a recordable MD, headphones with remote control, and LIP-8 lithium ion rechargeable battery
Station: Approx. 970 g (34.2 oz.)

Supplied accessories

AC power adaptor(1)
Card remote commander (1)
Headphones with remote control (1)
Lithium ion rechargeable battery LIP-8 (1)
Battery case (1)
Optical cable (1) (European model only)
Ear attachment (1)
Carrying pouch (1)

Optional accessories

Battery charger (for LIP-8) BC-LIP8
Lithium ion rechargeable battery LIP-8

Optical Cable

POC-151HG, POC-152HG, POC-MZ1, POC-MZ2, POC-15B, POC-15AB, POC-DA12SP
Line Cable RK-G136
Stereo Microphones ECM-717, ECM-MS907, ECM-MS957
Stereo Headphones MDR-D77, MDR-D55, MDR-CD470, MDR-E888SP
Active Speakers SRS-Z1000
Recordable MDs MDW-series
MiniDisc Carrying Case CK-MD4
MiniDisc Filing Box CK-MD10

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Design and specifications are subject to change without notice.

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ OR DOTTED LINE WITH MARK ⚠ ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ!

LES COMPOSANTS IDENTIFÉS PAR UNE MARQUE ⚠ SUR LES DIAGRAMMES SCHÉMATIQUES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈSES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DANS LES SUPPÉMENTS PUBLIÉS PAR SONY.

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MAIN FEATURES

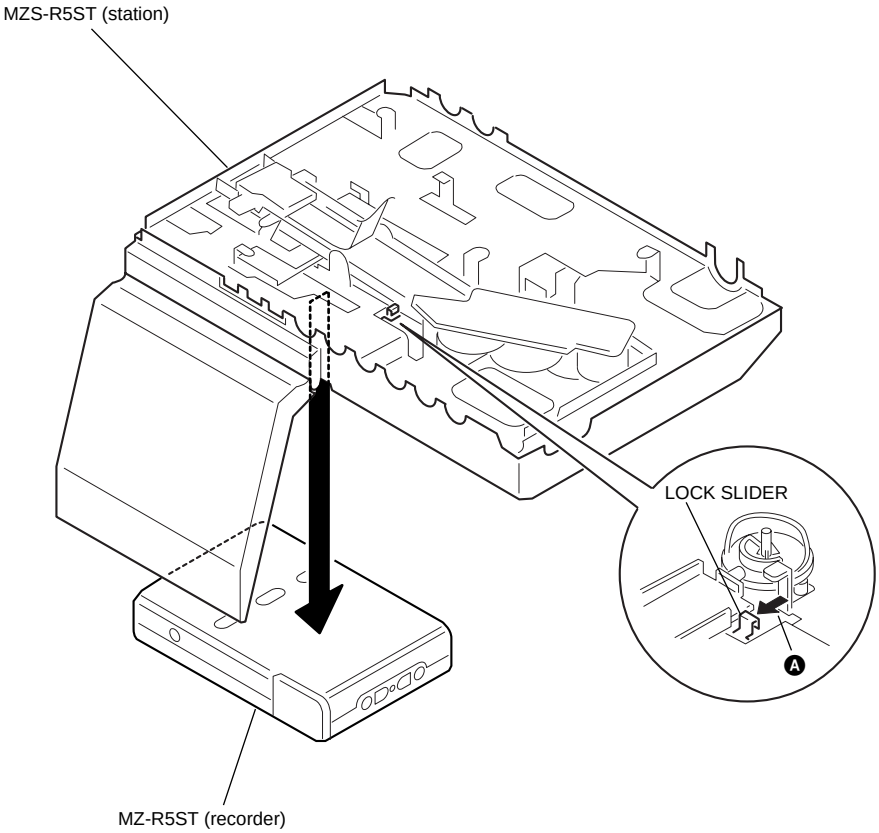
MZ-R5ST is the new Sony portable MiniDisc Recorder using the MiniDisc format.

- The MiniDisc station system – Use the recorder either by itself or attached to the station dock. Use the recorder attached to the station to enjoy full features and connectivity. Use the recorder detached from the station for portability.
- High-fidelity recording – Low-noise, how-distortion, high – fidelity recording through the optical digital input jack.
- Sampling rate converter – This unit enables you to record programs form digital equipment using other sampling rates, such as a BS tuner or DAT deck.
- Variety of recording options
  – Long recording with monaural recording (up to 148 minutes).
  – Time Machine recording enables you to record from the top of a song even if you pressed the button after you heard the beginning of the song.
  – Connect to an audio-timer to record when you are not home.
- Easy editing with the large LCD panel and the editing buttons
  – Title samples (21 words and phrases).
  – UNDO function lets you undo an editing operation.
- Programmed playback – Play any set of tracks in the order of your choice.
- Card remote commander – Operate the station from a distance. Direct Selection available.
- Output jack for active speakers – Connect to the active speakers SRS-Z1000 (not supplied), etc., to enjoy powerful MD playback at your desktop.

SECTION 1
SERVICE NOTES

When MZ-R5ST cannot be removed from MZS-R5ST, remove it as follows:
① Remove the CABINET (LOWER) ASSY and the RADIAL board of MZS-R5ST. (Refer to section 3. DISASSEMBLY on page 16.)
② Move the LOCK SLIDER in the direction (A) as shown by the arrow. (Refer to the illustration shown below.)

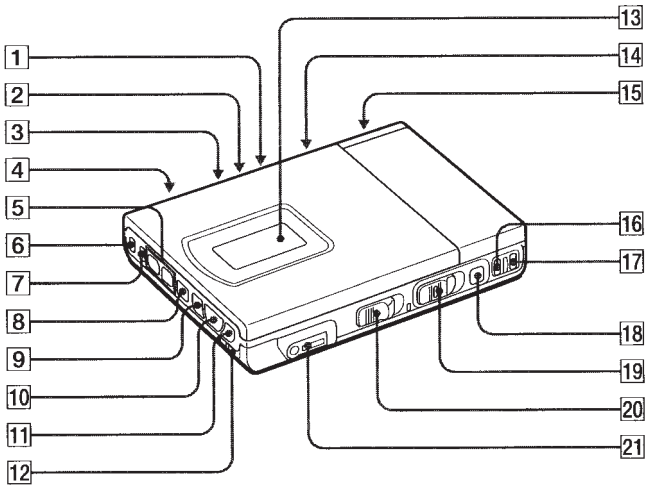
Note : When the above described procedure is performed, MZ-R5ST is removed all of a sudden. Be careful not to drop MZ-R5ST.



SECTION 2
GENERAL

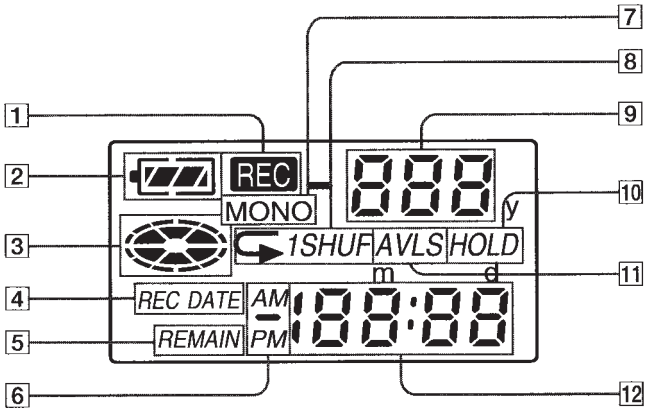
This section is extracted from instruction manual.

The recorder



1 MIC SENS (Mic sensitivity)
2 DIGITAL MEGA BASS switch
3 AVLS (Automatic Volume Limiter System) switch
4 MIC (PLUG IN POWER) jack
5 VOL (volume) –/+ buttons
6 MODE button
7 DISPLAY button
8 ■ (stop) button
9 ⏮ (rewind / AMS) button
10 ► (play) button
11 ⏭ (fast forward / AMS) button
12 HOLD switch
13 Display window
14 CLOCK SET button (at the bottom)
15 Battery compartment
16 END SEARCH button
17 T MARK button
18 ❚❚ (pause) button
19 REC switch
20 OPEN switch
21 🎧 / REMOTE (headphones / remote) jack

The display window of the recorder



1 REC indication
Lights up while recording. When flashing, the recorder is in record standby mode.

2 Battery indication
Shows battery condition. Lights up when a rechargeable battery is inserted. While charging the rechargeable battery, this indication shows the charging condition.

3 Disc indication
Shows that the disc is rotating for recording, playing or editing an MD.

4 REC DATE (recorded/current date) indication
Lights up along with the date and time the MD was recorded. When only "DATE" lights up, the current date and time are displayed.

5 REMAIN (remaining time/tracks) indication
Lights up along with the remaining number of tracks, remaining time of the track, or remaining time of the MD.

6 AM/PM indication
Lights up along with the time indication in the 12-hour system.

7 MONO (Monaural) indication

8 Play mode indication
Shows the play mode of the MD.
- (all repeat) : All tracks play repeatedly.
- *1*(single repeat) : One track plays repeatedly.
- *SHUF*(shuffle repeat) : Tracks will be repeated in random order.

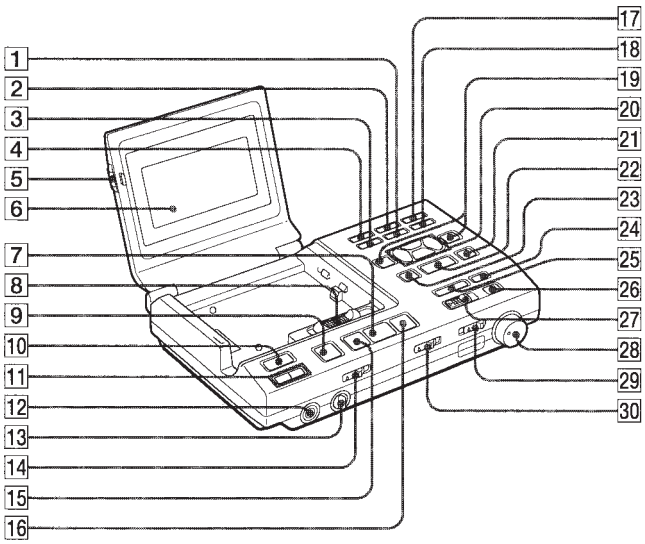
9 Track number indication
Shows the track number playing currently.

10 HOLD indication
Lights up when the HOLD switch is set on.

11 AVLS indication
Lights up when the AVLS switch is set on.

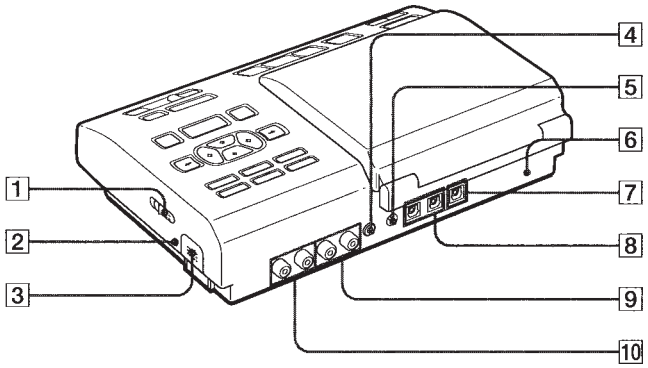
12 Time display
Shows the recorded time, current time, elapsed time of the track being played and the remaining time of the track or the disc.

Front panel of the Station



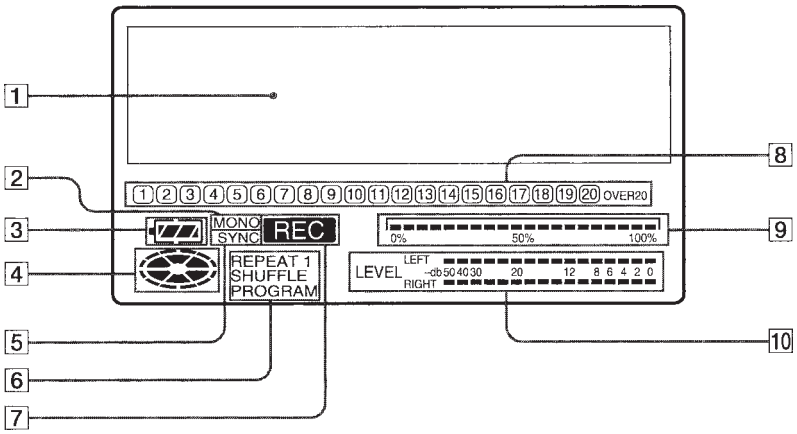
1 ERASE/DELETE button
2 MODE button
3 MOVE/INSERT button
4 DISPLAY button
5 PUSH OPEN button
6 Display window
7 ► (play) button
8 OPEN•RELEASE switch
9 ■ (stop) button
10 POWER switch
11 ACTIVE SP LEVEL –/+ buttons
12 ∩ HEADPHONES jack for stereo plug
13 LEVEL dial
Adjusts the volume of headphones connected to the ∩ HEADPHONES jack on the station, not the recorder.
14 TIMER switch
15 I◄◄ (rewind/AMS) button
16 ►►I (fast forward/AMS) button
17 TRACK MARK button
18 UNDO button
19 INPUT POSITION← / → (position) buttons
20 Cursor buttons
21 TITLE/ENTER button
22 SELECT button
23 CAPS button
24 END SEARCH button
25 TIME MACHINE REC button
26 ❚❚ (pause) button
27 REC switch
28 REC LEVEL (ANALOG) control
29 INPUT switch
30 SYNCHRO REC switch

Back panel of the Station



1 OPEN (open the lid) switch
2 CHARGE lamp
Lights up while charging the rechargeable battery on the station.
3 Rechargeable battery compartment
4 ACTIVE SP OUT jack
5 DC IN 9V jack
6 CLOCK SET button
7 DIGITAL OUT (OPTICAL) jack
8 DIGITAL IN (OPT1, OPT2) jack
9 LINE (ANALOG) OUT jack
10 LINE (ANALOG) IN jack

The display window of the Station



1 Character information display
Displays the disc and track names*, date, error messages, track numbers, etc.
*Disc and track names appear only with MDs that have been electronically labeled.

2 MONO (monaural) indication

3 Battery indication
Shows battery condition. Lights up when a rechargeable battery is inserted. While charging the rechargeable battery, this indication shows the charging condition.

4 Disc indication
Shows that the disc is rotating for recording, playing or editing an MD.

5 SYNC (synchronized recording) indication
Lights up while synchro-recording.

6 Play mode indication
Shows the play mode of the MD.
REPEAT (all repeat): All tracks play repeatedly.
REPEAT1 (single repeat): One track plays repeatedly.
REPEAT SHUFFLE (shuffle repeat): Tracks will be repeated in random order.
PROGRAM (program play): Lights up when programming for program play or executing program play.

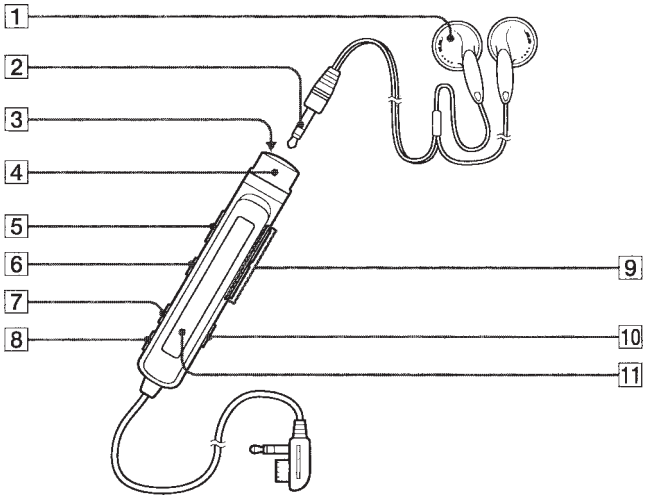
7 REC (record) indication
Lights up while recording. When flashing, the recorder is in record standby mode.

8 Music calendar
Displays the number of tracks recorded in MD, remaining tracks during shuffle play.

9 Position pointer
Shows the current location on the MD.
The point under recording or playing flashes. The recorded position lights up.

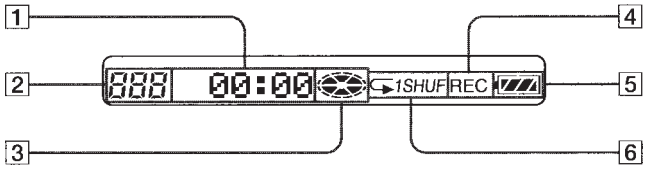
10 Peak level meter
Shows the volume of the MD being played or recorded.

The headphones with a remote control



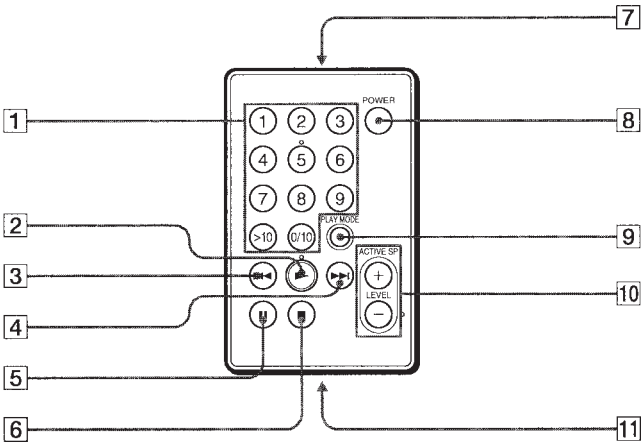
1 Headphones
Can be replaced with optional headphones.
2 Stereo mini plug
3 ■ (stop) button
4 Control
To play, turn to ► • ►►I during stop.
Turn to ► • ►►I during play to search the beginning of the succeeding track; hold in this position to fast-forward.
Turn to I◄◄ during play to search the beginning of the preceeding track; hold in this position to rewind.
5 HOLD switch
Slide to lock the controls of the remote control.
6 ❚❚ (pause) button
7 PLAY MODE button
8 DISPLAY button
9 VOL (volume) –/+ buttons
10 TRACK MARK button
11 Display window

The display window of the remote control



1 Character information display
Displays the disc and track names, date, elapsed time, etc.
2 Track number indication
Shows the track number of the track being recorded or played.
3 Disc indication
Shows that the disc is rotating for recording, playing or editing an MD.
4 REC (record) indication
Lights up while recording. When flashing, the recorder is in record standby mode.
5 Battery indication
Shows battery condition. While charging the rechargeable battery, this indication shows the charging condition.
6 Play mode indication
Shows the play mode of the MD.

Card remote commander



1 Number keys
2 ► (play) button
3 I◄◄ (rewind/AMS) button
4 ►►I (fast forward/AMS) button
5 II (pause) button
6 ■ (stop) button
7 Transmitter
Direct it toward the receiver on the station.
8 POWER switch
9 PLAY MODE button
10 ACTIVE SP (active speaker) LEVEL +/– buttons
11 Battery compartment

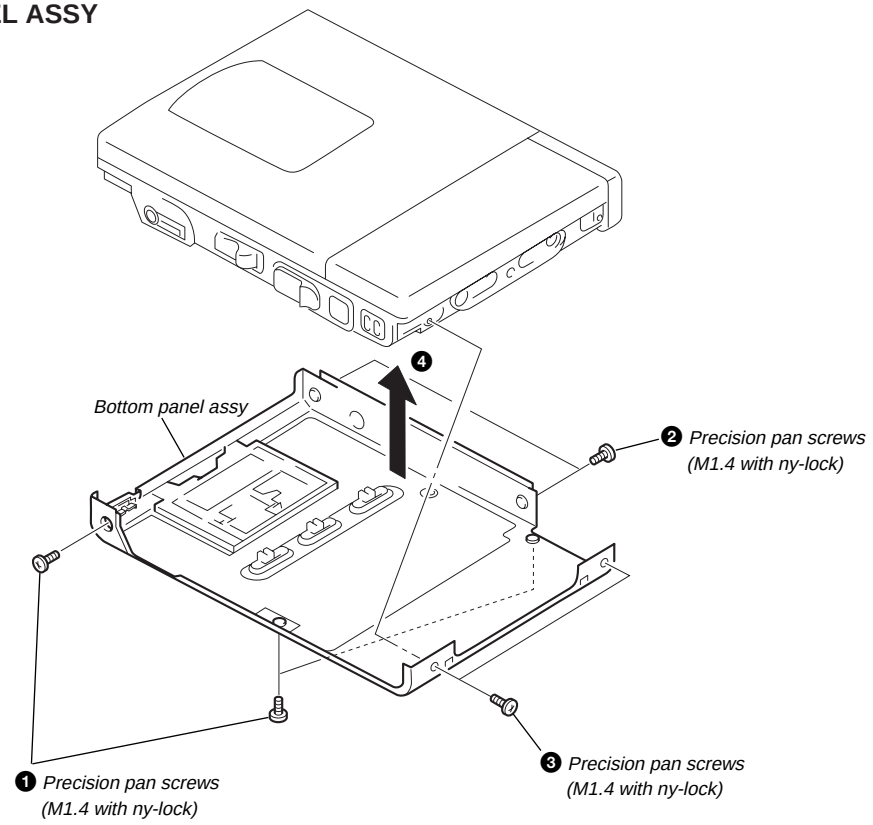
SECTION3
DISASSEMBLY

• MZ-R5ST
• MZ-R5ST can be disassembled in the following order.

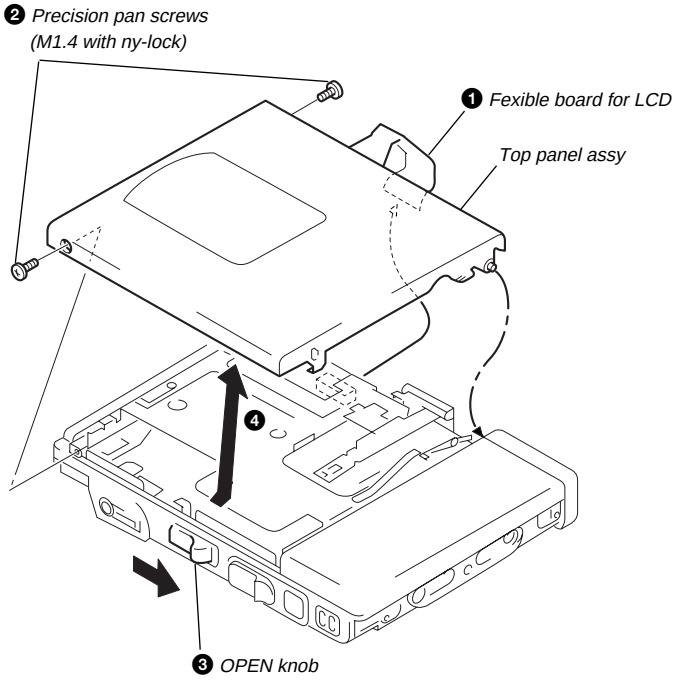
MZ-R5ST recorder → Bottom Panel Assy / Top Panel Assy → MAIN Board → Mechanism Deck → Optical Pick-up Assy, REC Board / CLV Board
MZ-R5ST recorder → Bottom Panel Assy / Top Panel Assy → MAIN Board → Battery Case Assy → POWER Board, SW Board

Note : Follow the disassembly procedure in the numerical order given.

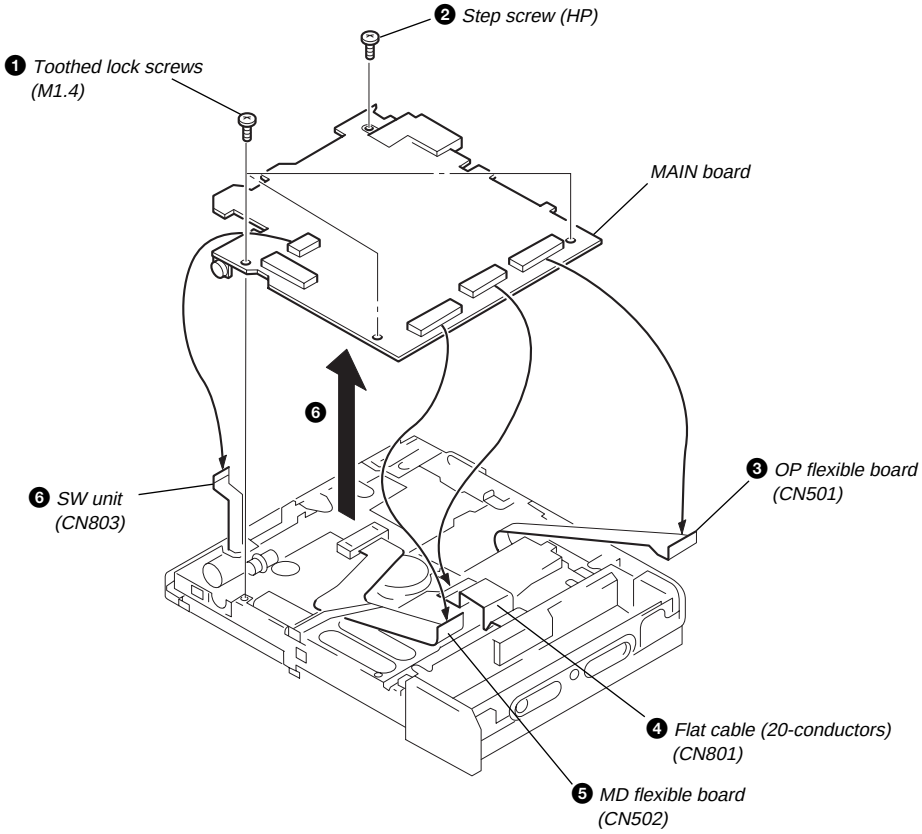
3-1. BOTTOM PANEL ASSY



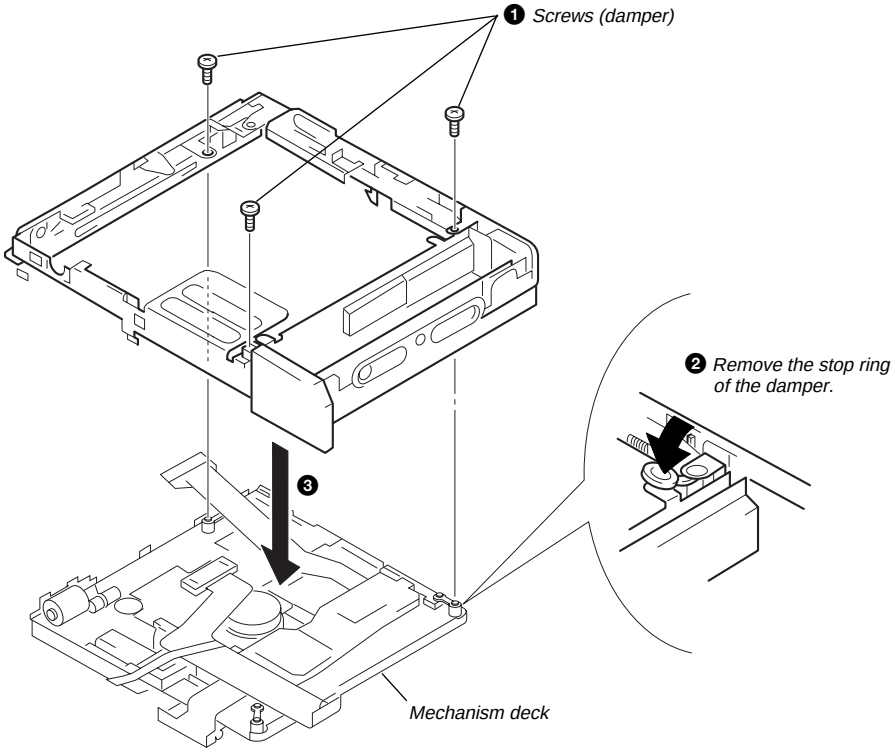
3-2. TOP PANEL ASSY



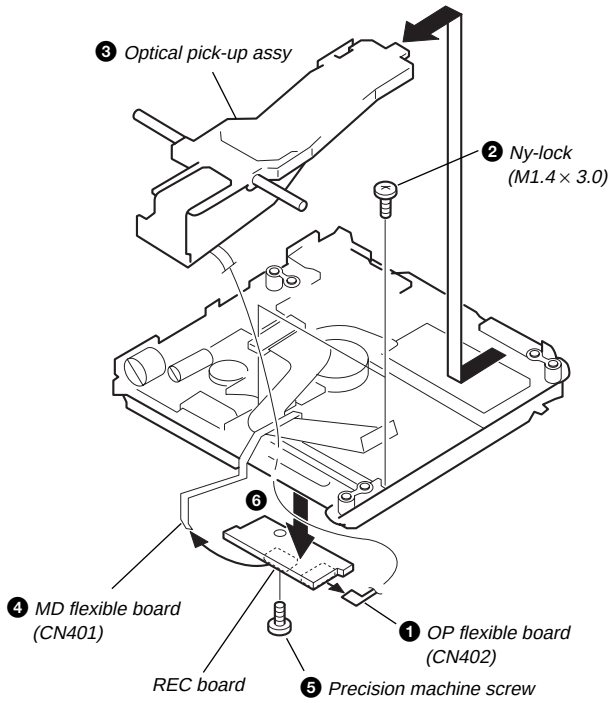
3-3. MAIN BOARD



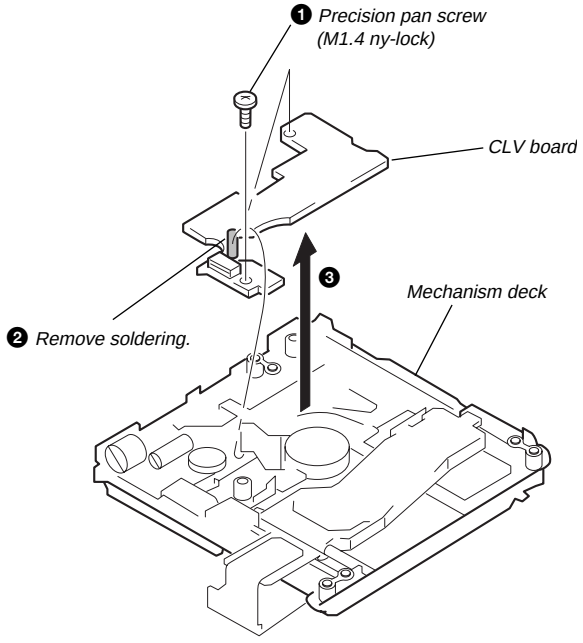
3-4. MECHANISM DECK (MT-MZR50-143)



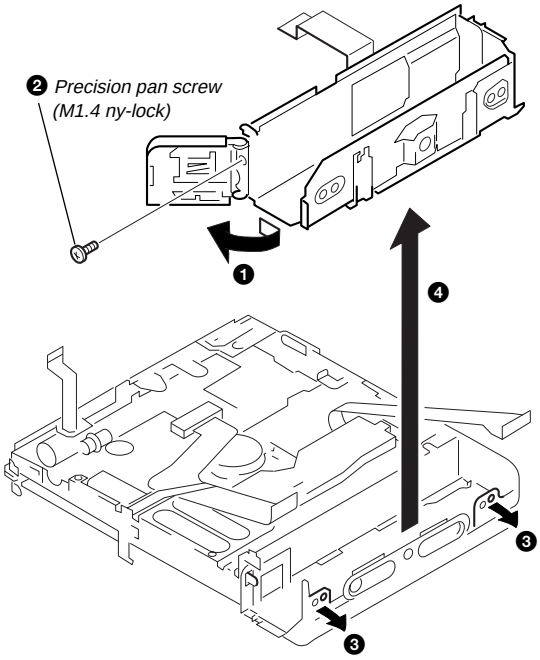
3-5. OPTICAL PICK-UP ASSY, REC BOARD



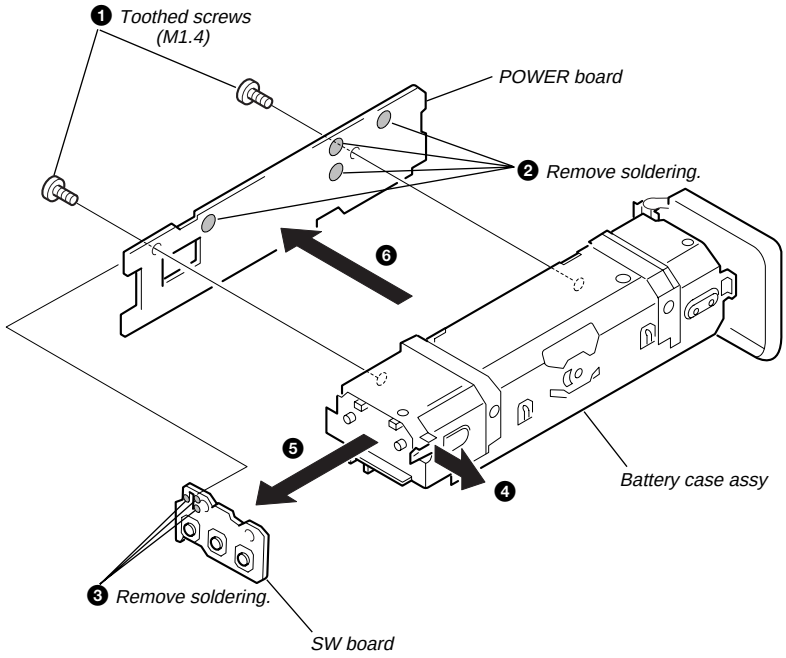
3-6. CLV BOARD



3-7. BATTERY CASE ASSY



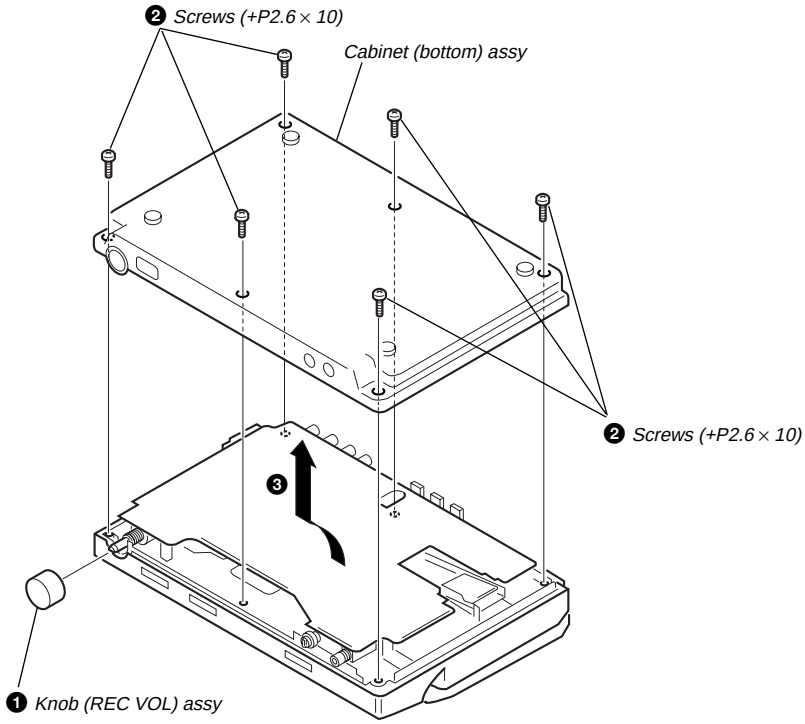
3-8. POWER BOARD, SW BOARD



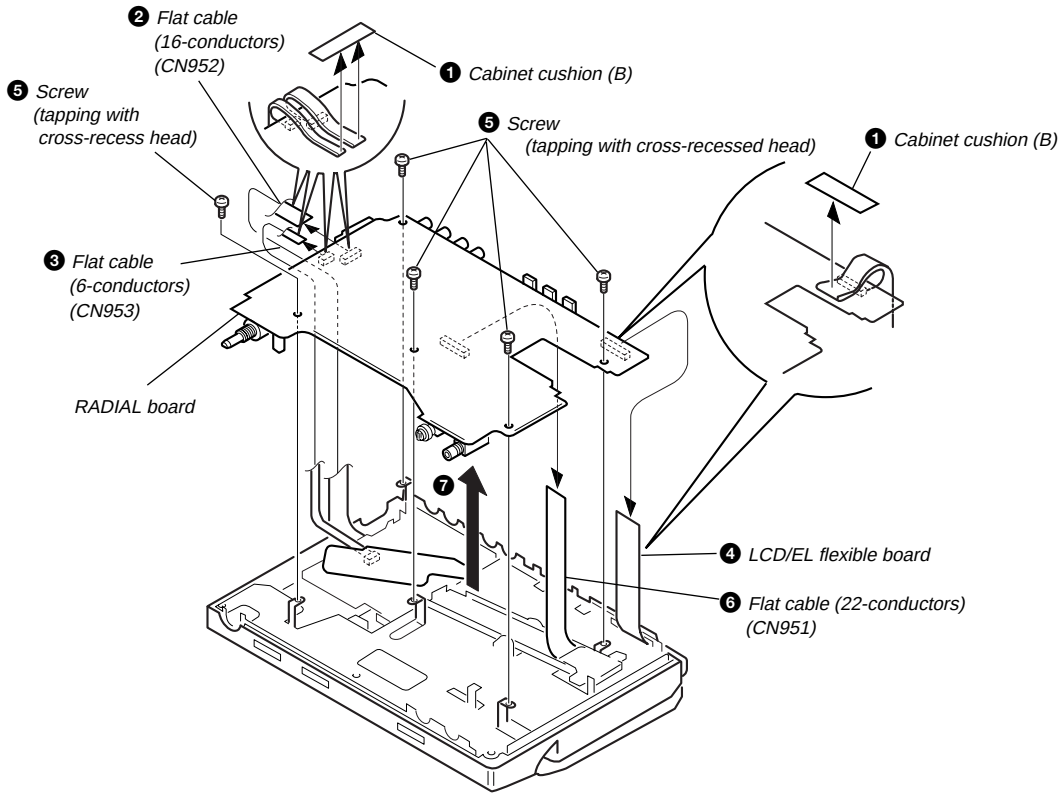
• MZS-R5ST
• MZS-R5ST can be disassembled in the following order.

MZS-R5ST Station ➡ Cabinet (LOWER) Assy ➡ RADIAL Board ➡ Chassis Assy
LCD Block Assy ➡ LCD Module, LCD/EL Board

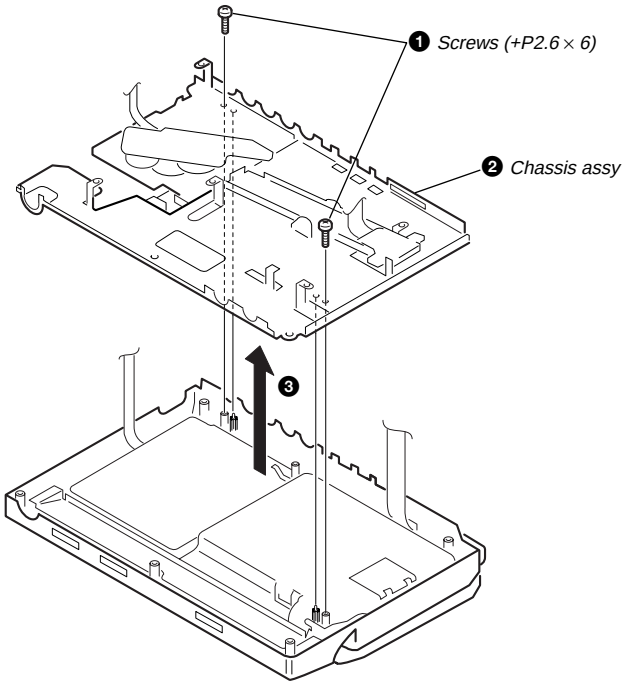
3-9. CABINET (LOWER) ASS'Y



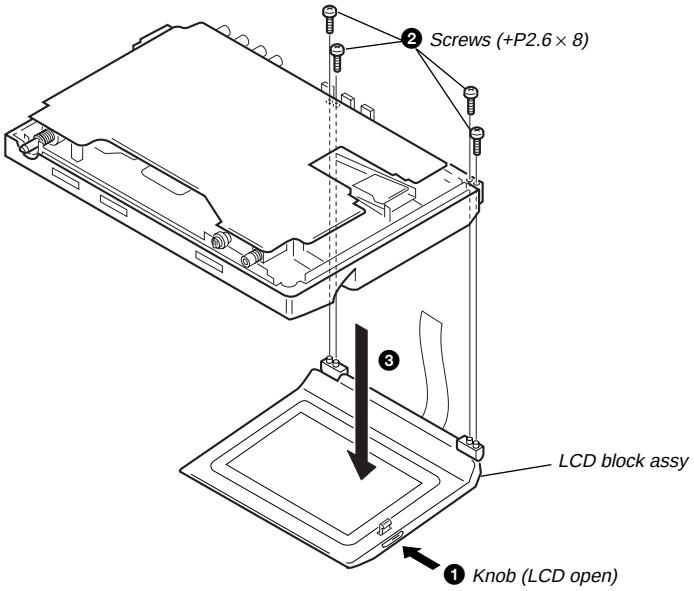
3-10. RADIAL BOARD



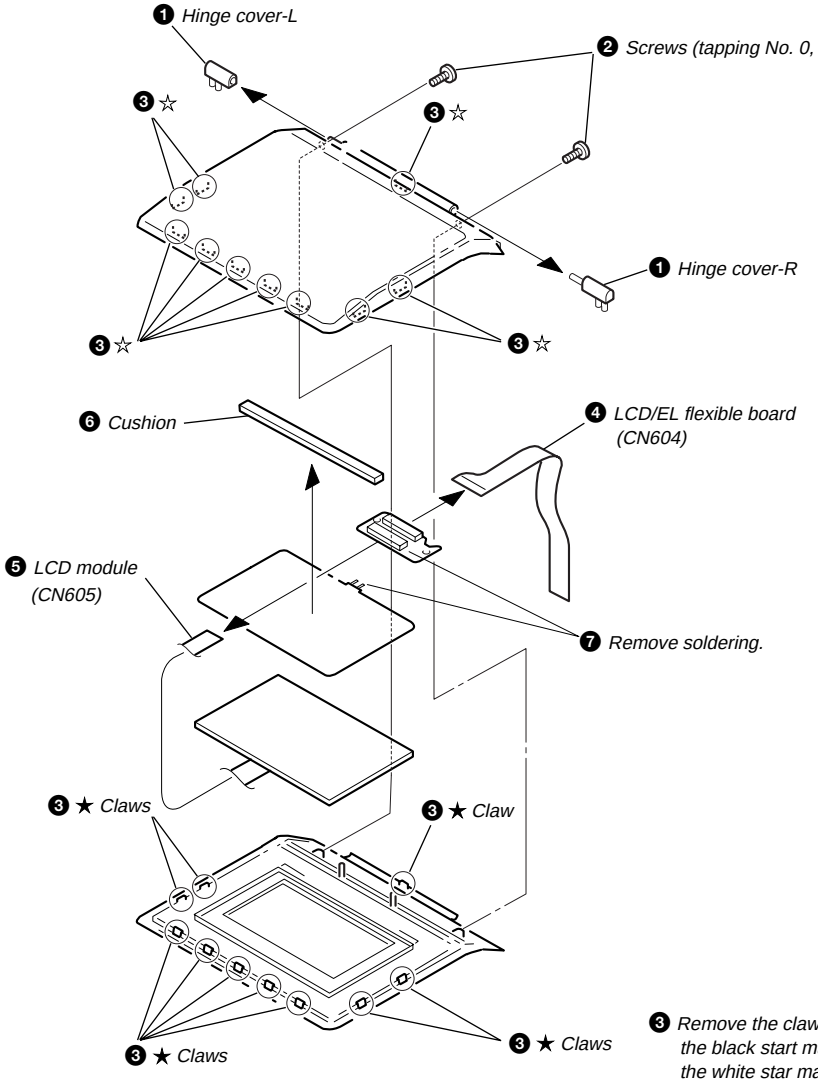
3-11. CHASSIS ASSY



3-12. LCD BLOCK ASSY



3-13. LCD MODULE, LCD/EL BOARD



❸ *Remove the claws (10 claws) as shown by the black start marks (★) from the white star marked (☆) positions.*

SECTION 4
TEST MODE

MD Block

Outline

- In this machine, the overall adjustment mode in which the automatic adjustments of CD and MO are performed, is established when the machine enters the test mode. In the overall adjustment mode, the loaded disc is identified whether it is CD or MO disc, and the various adjustments are performed in the order as shown below. When a fault is found during the test mode, location of a fault is displayed. In servo mode, the various adjustments are performed automatically too in the order as shown below.

How to enter the test mode

There are two methods to enter the test mode:

1. The method of enter the test mode by shorting the TEST soldering bridge
   Connect the solder bridge TAP803 (TEST) on the MAIN board by soldering (i.e., connecting IC801 ⑮ to GND), and turn on the main power.
2. The method of enter the test mode by pressing the keys
   While depressing the ► key, press the keys ▶▶I , ▶▶I , I◀◀ , I◀◀ , ▶▶I , I◀◀ , ▶▶I , I◀◀ , ❚❚ , ❚❚ in this order.

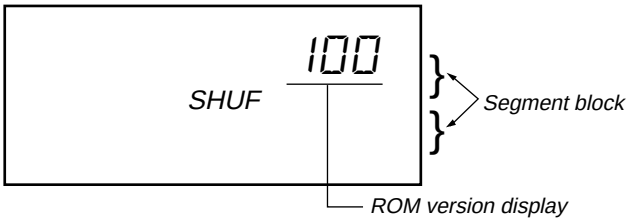
How to exit the test mode

1. When the solder bridge TAP803 is shorted to enter the test mode, turn off the main power and remove soldering from the TAP803 to open the solder bridge.
2. When the machine has entered by pressing the key, turn off the main power of the machine to exit the test mode.

Operation when setting the test mode

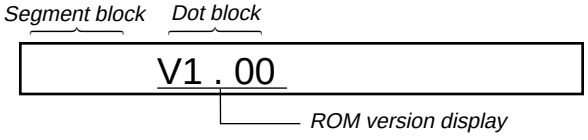
When machine enters the test mode, the following initial display appears on LCD and the display changes as described below.

< LCD display on the machine >



- On the LCD of the machine, the sequence of display starting from the all segments turn on → all segments turn off → ROM version display, is repeated.

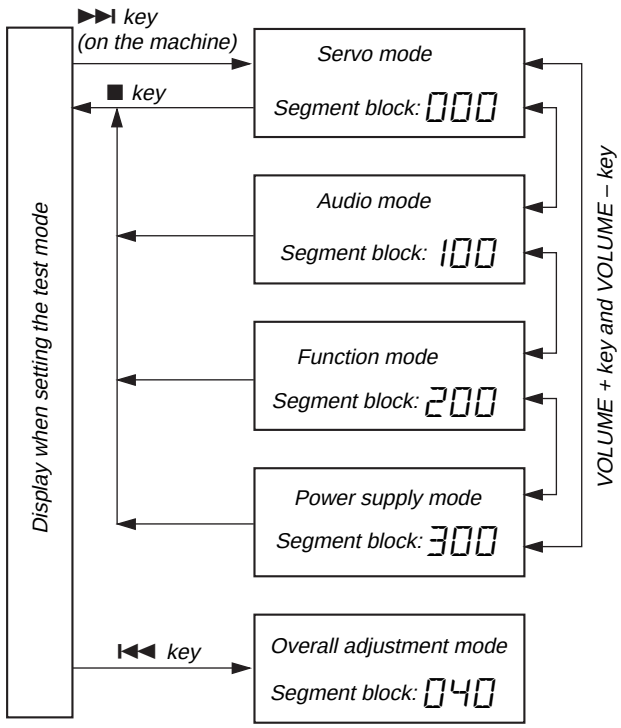
< LCD display on remote control >



- On the LCD of remote control, the sequence of display starting from ROM version display → all segments turn on → all segments turn off, is repeated.
- On both of the machine and remote control, the display is held as long as the ❚❚ key is being pressed which enables to check the LCD display.

Test mode configuration

Test mode of this machine consists of the following five modes.

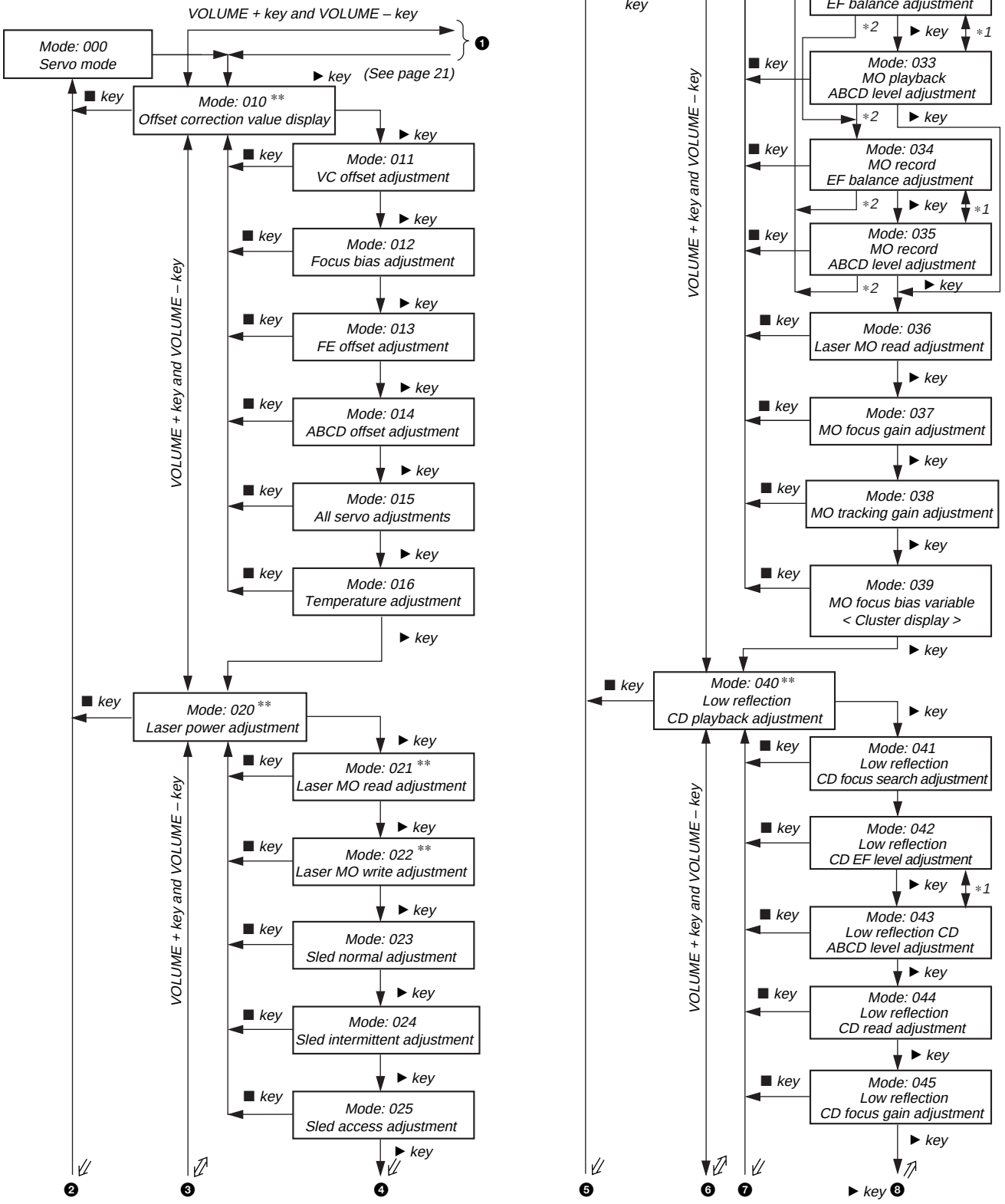


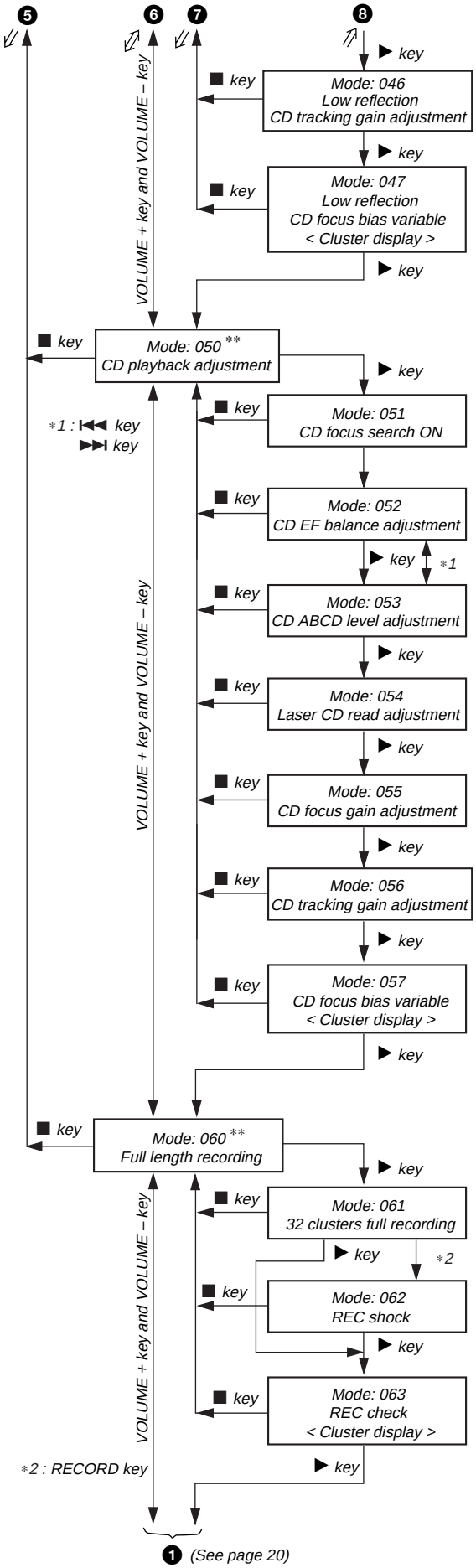
- In the modes other than the overall adjustment mode, the mode number appears in the 000 block.

Servo mode

- How to enter the servo mode
  After entering the test mode, while pressing ▶▶I key, press the VOLUME + key and VOLUME - key to enter the servo mode.
- When the machine enters the servo mode, the optical pickup moves to the outer circumference and to the inner circumference respectively by pressing the ▶▶I key and I◀◀ key. (In the items marked by asterisk ** only)
- To enter the other modes of the test mode, re-enter the test mode again. Refer to the section [Test mode configuration].

- **Servo mode configuration**

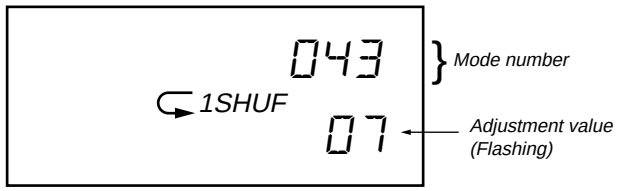




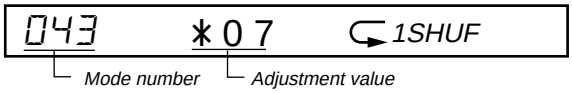
- **Servo adjustment method**

1. The adjustment values stored in EEPROM and the mode numbers are displayed when the machine enters the respective servo adjustment mode in accordance with the procedure shown in the servo mode configuration.

< LCD display on the machine >

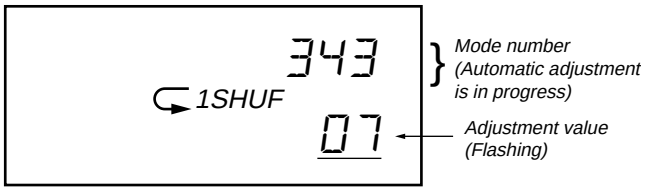


< LCD display on remote control >

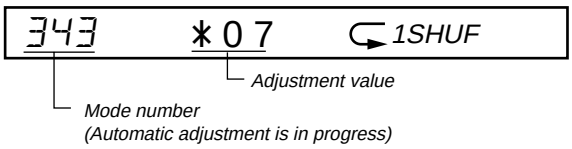


2. When the ❚❚ key is pressed, the following display appears and the automatic adjustment of the servo mode starts.

< LCD display on the machine >



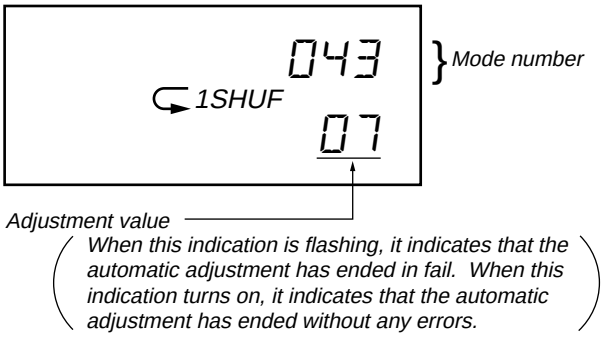
< LCD display on remote control >



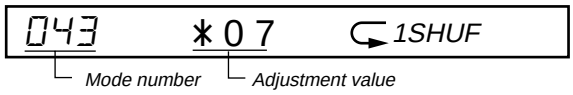
Note : The adjustment values can be changed as you want when the VOLUME + and the VOLUME – key is pressed. However, do not attempt to adjust the servo values because it is dangerous.

3. When all items of the servo mode automatic adjustment are completed, the display returns to the item display on which the adjustment values are shown.

< LCD display on the machine >

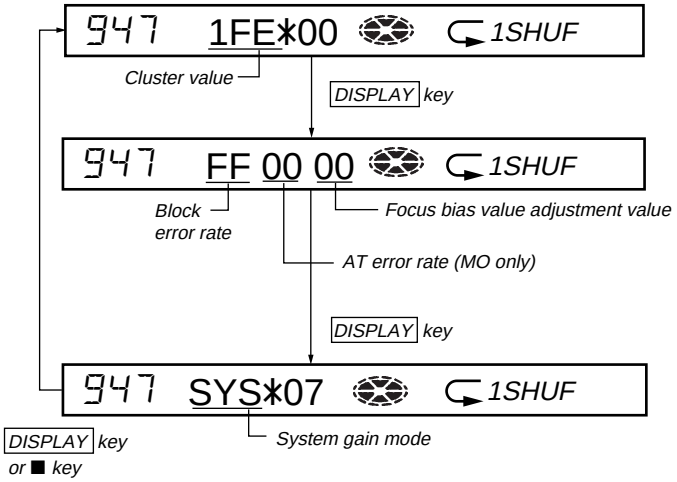

043
1SHUF
07
Mode number
Adjustment value
When this indication is flashing, it indicates that the automatic adjustment has ended in fail. When this indication turns on, it indicates that the automatic adjustment has ended without any errors.

< LCD display on remote control >



- The cluster display (It is not displayed on LCD of the machine.)

< LCD display on remote control >

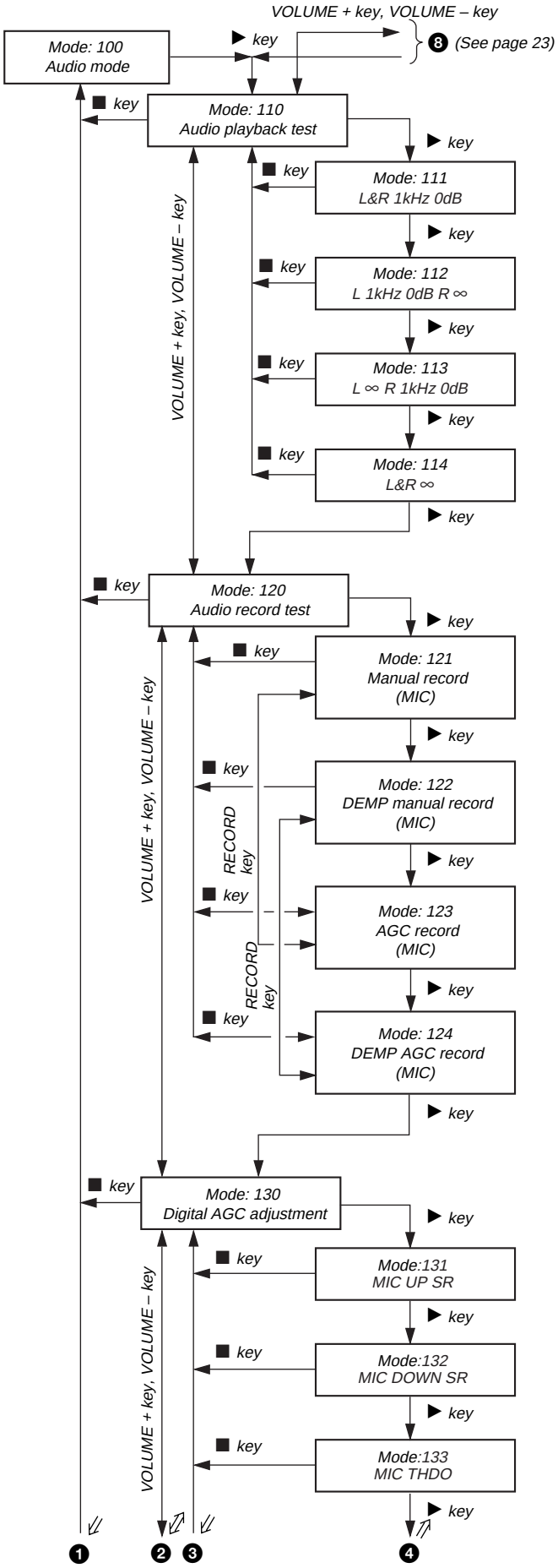


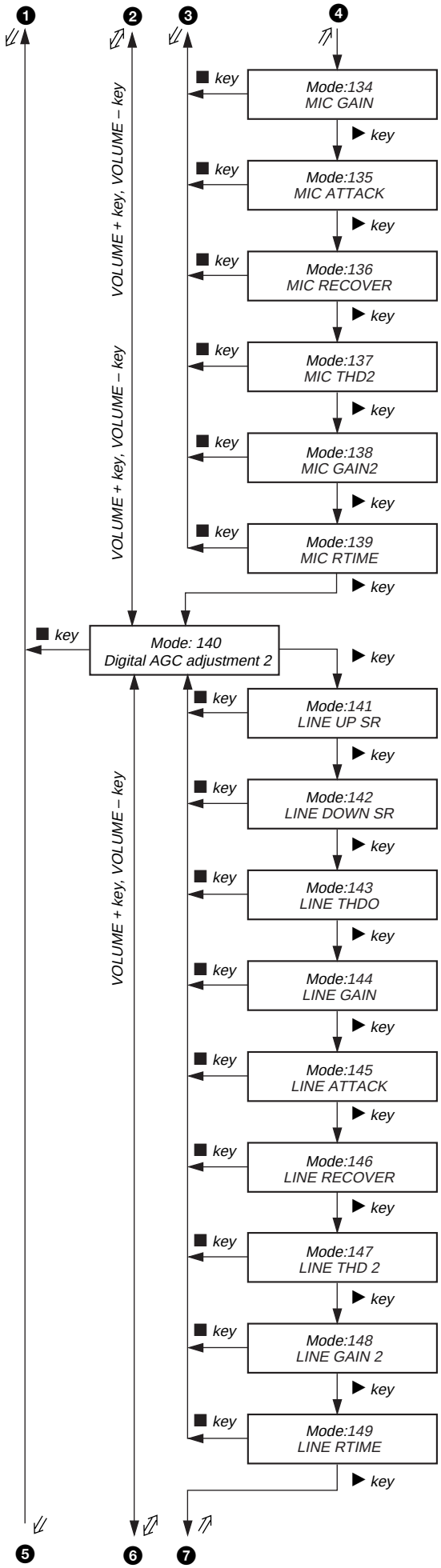
- All key operations must be performed from the remote control.

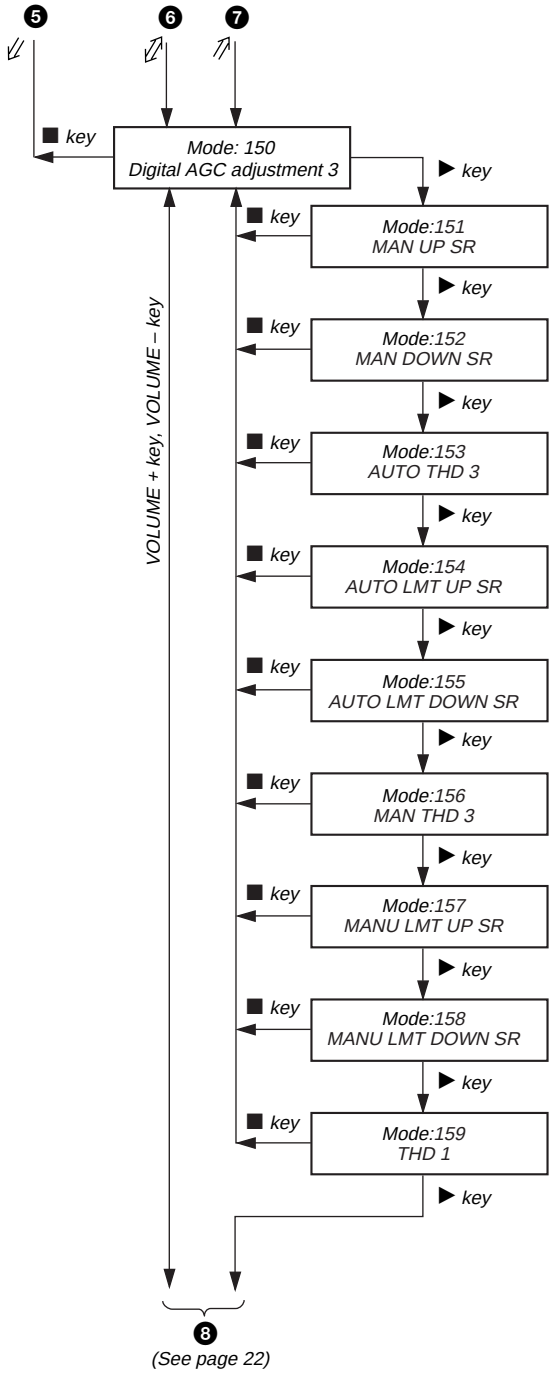
Audio Mode

- How to enter the audio mode
  After entering the test mode, while pressing ▶▶I key, press the VOLUME + key and VOLUME – key to enter the audio mode.
- To enter the other modes of the test mode, re-enter the test mode again. Refer to the section [Test mode configuration].

- **Audio mode configuration**





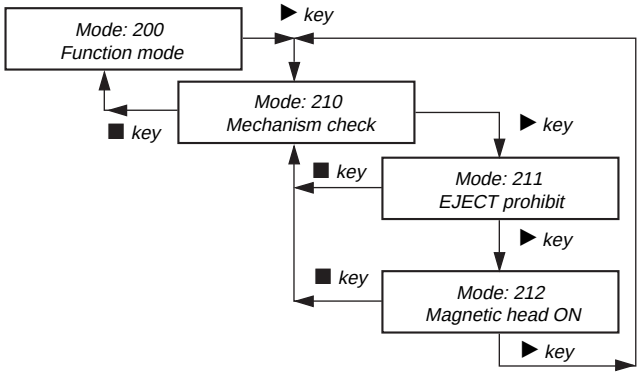


- Buzzer sounds when ❚❚ key is pressed in the audio mode numbers 110 to 114. (Hold switch: OFF)
- Headphone output level increases or decreases when the VOLUME + key or the VOLUME – key is pressed in the audio mode numbers from 111 to 113, 123 or 124. The headphone output goes minimum or maximum when ⏮ key or ⏭ key is pressed.
- The record level increases or decreases when the VOLUME + key or the VOLUME – key is pressed in the audio mode numbers 121 or 122. The record level goes minimum or maximum when ⏮ key or ⏭ key is pressed.
- The record LED flashes in the audio mode numbers from 120 to 124.

Function Mode

- How to enter the function mode
  After entering the test mode, while pressing ▶▶I key, press the VOLUME + key and VOLUME – key to enter the function mode.
- To enter the other modes of the test mode, re-enter the test mode again. Refer to the section [Test mode configuration].

- **Function mode configuration**

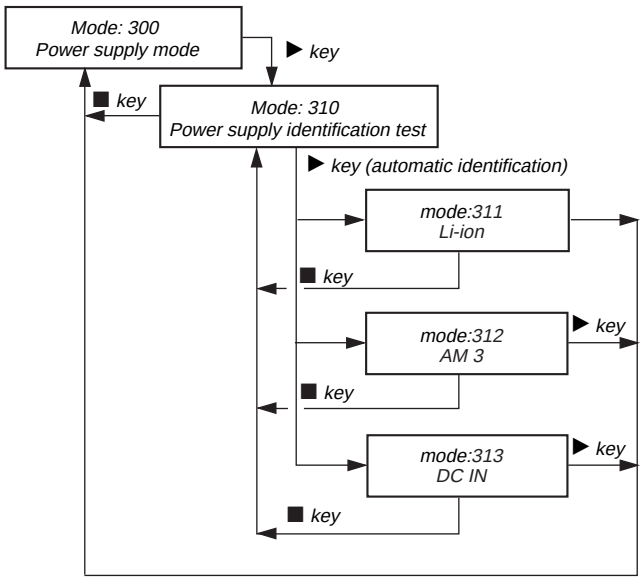


- When the machine enters the function mode Nos. 200, 210 to 212, the optical pickup moves to the outer circumference and to the inner circumference respectively by pressing the I◀◀ key and ▶▶I key.

Power Supply Mode

- How to enter the power supply mode
  After entering the test mode, while pressing ▶▶I key, press the VOLUME + key and VOLUME – key to enter the power supply mode.
- To enter the other modes of the test mode, re-enter the test mode again. Refer to the section [Test mode configuration].

- **Power supply mode configuration**

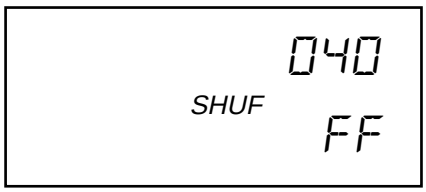


Overall Adjustment Mode

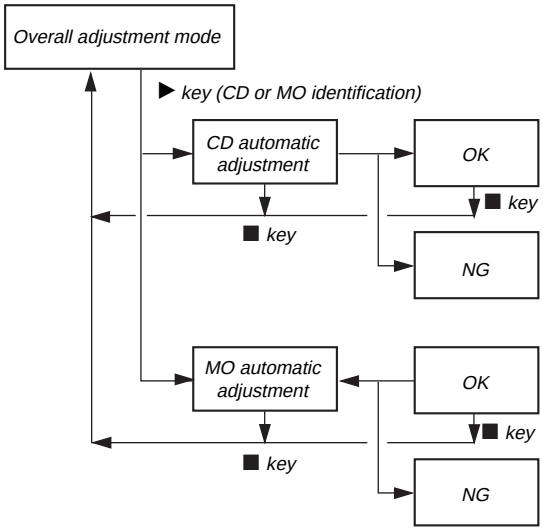
- How to enter the overall adjustment mode
  After entering the test mode, press the I◀◀ key to enter the overall adjustment mode.
- To enter the other modes of the test mode, exit the test mode once, and re-enter the test mode again.
- When the machine enters the overall adjustment mode, the LCD display on the remote control unit and on the station appears as shown below.

< LCD display on remote control >

< LCD display on the machine >



- **Overall adjustment mode configuration**



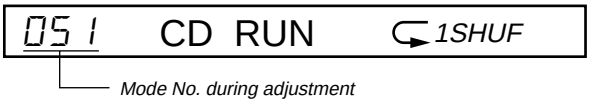
- **Overall adjustment method**

1. Enter the test mode. Press the ⏮ key to enter the overall adjustment mode.
2. Insert the CD test disc (TDYS-1) or commercially available Sony MO disc.
3. Press the ► key. The machine identifies the inserted disc whether it is CD or MO disc, and enter the respective automatic adjustment mode. The following adjustments are performed automatically in the following order.
   - Adjustment items during the CD automatic adjustment mode

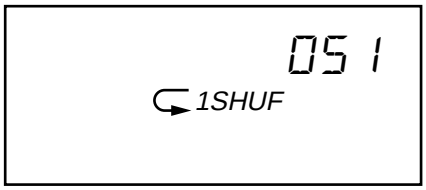
No.	Mode No.	Adjustment contents
1	051	CD focus search
2	052	CD EF balance adjustment
3	053	CD ABCD level adjustment
4	055	CD focus gain adjustment
5	056	CD tracking gain adjustment
6	057	CD focus bias variable

* LCD display during the CD automatic adjustment mode

< LCD display on remote control >



< LCD display on the machine >

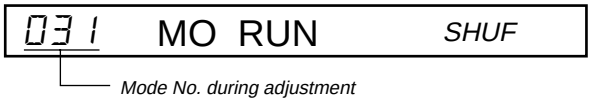


- Adjustment items during the MO automatic adjustment mode

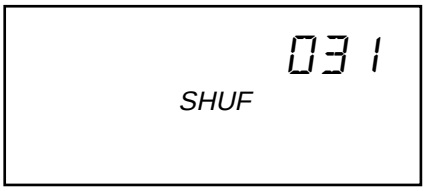
No.	Mode No.	Adjustment contents
1	031	MO focus search
2	032	MO playback EF balance adjustment
3	033	MO playback ABCD level adjustment
4	034	MO record EF balance adjustment
5	035	MO record ABCD level adjustment
6	037	MO focus gain adjustment
7	038	MO tracking gain adjustment
8	061	Full length recording (32 to 45 clusters)
9	082	AT error check
10	062	REC shock
11	063	REC check (32 cluster)
12	039	MO focus bias variable
13	082	AT error check
14	042	Low reflection CD EF balance adjustment
15	043	Low reflection CD ABCD level adjustment
16	045	Low reflection CD focus gain adjustment
17	056	Low reflection CD tracking gain adjustment

* LCD display during the MO automatic adjustment

< LCD display on remote control >

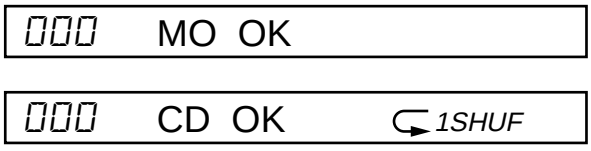


< LCD display on the machine >

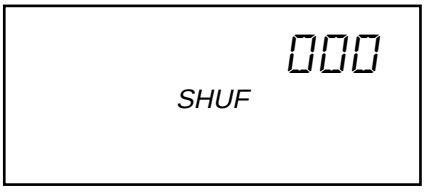


4. When result of the automatic adjustment ended without any errors, the following display appears.

< LCD display on remote control >

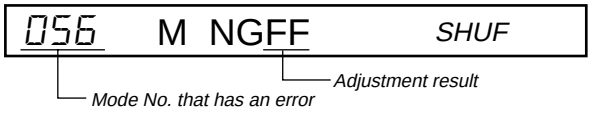


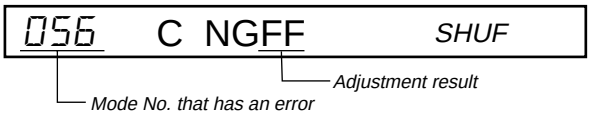
< LCD display on the machine >



5. When result of the automatic adjustment ended in fail, the following display appears.

< LCD display on remote control >





* When the automatic adjustment ended in fail, let's the machine enter the servo mode and perform the automatic adjustment of the item that has caused the error. (Refer to the Servo Mode.)

Station Block

Outline

The following operation of the machine can be checked on the LCD display when the machine enters the test mode.

- ON/OFF control of the charging circuit of the machine (MD)
- ON/OFF control of the charging circuit of the station
- Motor control of the station attachment section of the machine
- Accepting the various key inputs

How to enter the test mode

There are two methods to enter the test mode:

Method 1. The method of enter the test mode by shorting the TEST soldering bridge

1. Connect the solder bridge TAP901 (TEST) on the RADIAL board by soldering.
2. Turn on the main power.
3. Press the RESET switch.

Method 2. The method of enter the test mode by pressing the keys

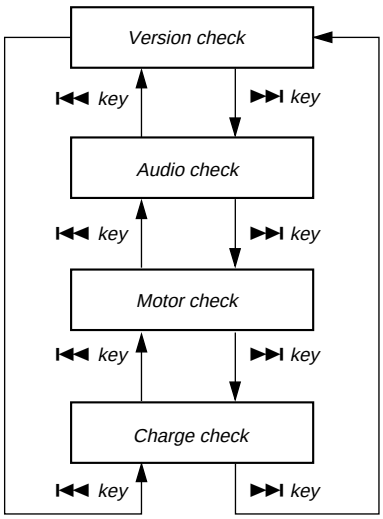
1. Turn on the main power of the machine.
2. While depressing the ▶ key, press the keys ▶▶I , ▶▶I , I◀◀ , I◀◀ , ▶▶I , I◀◀ , ▶▶I , I◀◀ , ▮▮, ▮▮in this order.

How to exit the test mode

1. When the solder bridge TAP901 is shorted to enter the test mode, turn off the main power and remove soldering from the TAP901 to open the solder bridge. Press the RESET switch.
2. When the machine has entered by pressing the key, turn off the main power of the machine to exit the test mode. Press the RESET switch.

Test mode configuration

Test mode of this machine consists of the following five modes.

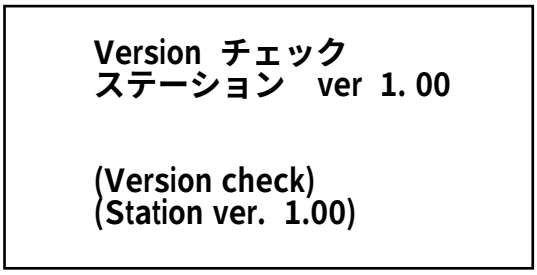


* The machine enters forcibly to the initial check of the motor check mode when the RELEASE ➡ slide switch is moved in the arrow direction during the test mode. However, this slide switch is used to switch ON or OFF of charging when the machine checks the charging during the charge check mode.

Version check mode

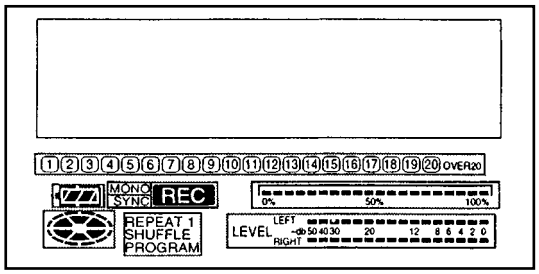
- The machine enters the version check mode when the test mode is established.
- The version check mode is used to check the software version number of the station microprocessor and to check the LCD segments that there are no defective segments.
- The LCD display repeats the LCD screens starting from the " Version check" screen → LCD all segments turning on check screen → LCD all segments turning off check screen at a specified cycle. (Less than one second)
- Cyclic repetition of the LCD screens can be tentatively stopped when the ▮▮ key is pressed. The tentative stop of LCD displays can be released by pressing the ▮▮ key again.

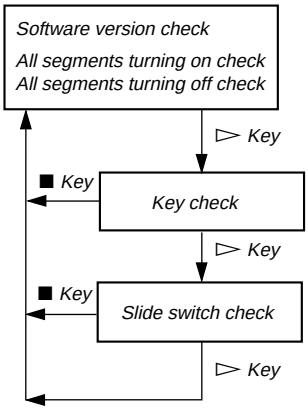
Version check screen



The characters in parenthesis ( ) are not displayed.

LCD all segments turning on check screen





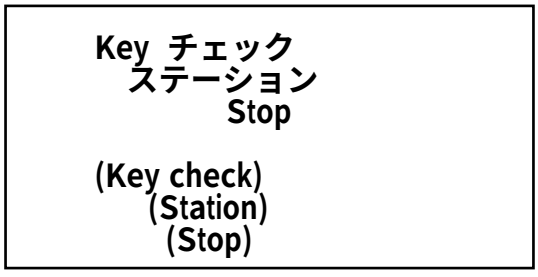
Key check mode

- Name of the key corresponding to the depressed key on the station or on the remote control, is displayed in the key check mode.

Station

Key	LCD display
⏮	FR
⏭	FF
END SEARCH	Ends
REC ●	Rec
PAUSE ⏸	Pause
TIME MACHINE REC	T.REC
CAPS	Caps
SELECT	Select
TITLE/ENTER	Enter
INPUT POSITION ←	<
⬅	Left
⬆	Up
⬇	Down
➡	Right
INPUT POSITION →	>
MOVE/INSERT	Move
ERASE/DELETE	Erase
UNDO	Undo
DISPLAY	Disp
MODE	Mode
TRACK MARK	T mark
ACTIVE SP LEVEL –	–
ACTIVE SP LEVEL +	+
POWER	Power

Key check screen



The characters in parenthesis ( ) are not displayed.

Remote control unit

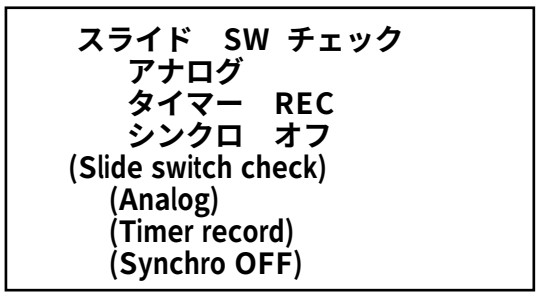
Key	LCD display
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
0/10	0
>10	>10
▷	Play
⏸	Pause
■	Stop
⏮	FR
⏭	FF
MODE	Mode
SP VOL +	+
SP VOL –	–
POWER	Power

Slide switch check mode

- The slide switch status is displayed in this mode.

Switch/position		LCD display
INPUT	ANALOG	アナログ (Analog)
	OPT1	デジタル1 (Digital 1)
	OPT2	デジタル1 (Digital 2)
TIMER	(END SEARCH) REC	タイマーREC (Timer REC)
	OFF	タイマーOFF (Timer OFF)
	PLAY	タイマーPLAY (Timer PLAY)
SYNCHRO REC	OFF	シンクロオフ (Synchro OFF)
	ON	シンクロオン (Synchro ON)

Slide switch check screen



The characters in parenthesis ( ) are not displayed.

Audio check screen

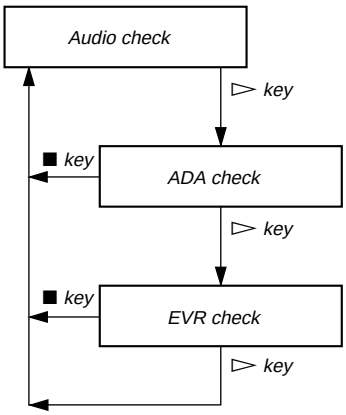
```
Audio  チェック

(Audio check)
```

The characters in parenthesis ( ) are not displayed.

Audio check mode

- The 20-bit ADA and EVR operations can be checked in this mode.



ADA check mode

ADA check screen

```
Audio  チェック
 ADA  チェック

(Audio check)
 (ADA check)
```

The characters in parenthesis ( ) are not displayed.

- The above display appears to show that the machine enters the ADA check mode. However, no checks are performed in this mode.

EVR check mode

- When the ACTIVE SP LEVEL + key is pressed, number of the Vol step indication increases. Pressing the ACTIVE SP LEVEL – key decreases number of the Vol step.
- Pressing the ▶▶I key indicates the maximum value (030). Press the I◀◀ key indicates the minimum value (000).

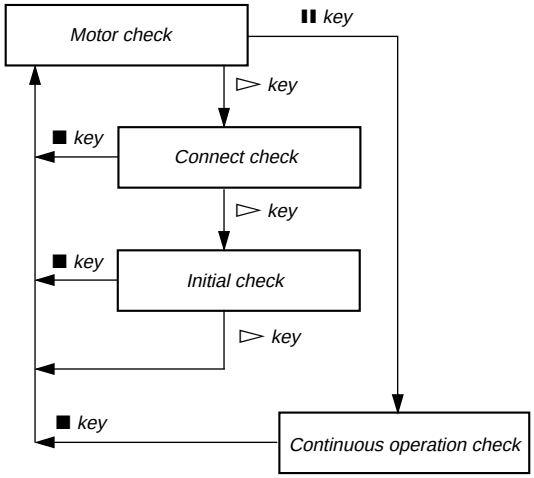
Screen

```
Audio  チェック
 EVR  チェック
 vol  step = 000

(Audio check)
 (EVR check)
 (vol step = 000)
```

The characters in parenthesis ( ) are not displayed.

Motor check mode



- How to enter the motor check mode
  Enter the test mode. Then press the ▶▶I key, the I◀◀ key to enter the motor check mode.

Screen

```
Motor  チェック

(Motor check)
```

The characters in parenthesis ( ) are not displayed.

Connection check mode

- The following display appears when the machine enters the connection check mode.

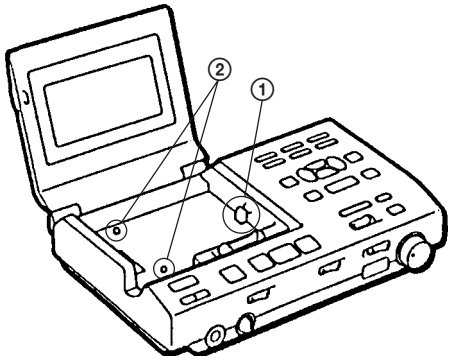
Screen

```
Motor  チェック
   Connect  チェック
   Open  Shutter ! !

(Motor check)
  (Connect check)
  (Open  Shutter ! !)
```

The characters in parenthesis ( ) are not displayed.

- To open the shutter, press the two buttons ② at the same time while depressing the slide switch ①.



- The shutter is opened and the connector moves upwards.

Initial check mode

Display screen

```
Motor　チェック
   Ｉｎｉｔｉａｌ チェック

(Motor check)
   (Ｉｎｉｔｉａｌcheck)
```

The characters in parenthesis (　) are not displayed.

- When the machine enters the initial check mode, the connector that has been moved upwards before, moves down and closes the shutter.

Screen when error occurs

```
Motor　チェック
   Ｉｎｉｔｉａｌ チェック
   ﾄﾞｳｻﾃﾞｹﾏﾍﾝ！！！
(Motor check)
  (Ｉｎｉｔｉａｌcheck)
  (Machine does not operate)
```

The characters in parenthesis (　) are not displayed.

Continuous operation mode

- The continuous operations at the connection position and the initial position are performed successively.

Display screen

```
Motor　チェック
   レンゾクドウサ

(Motor check)
   (Continuous operation)
```

The characters in parenthesis (　) are not displayed.

- The continuous operation mode starts when the shutter is opened. (Refer to the Connection check mode on the procedure of how to open the shutter.)

Charge check mode

- How to enter the charge check mode

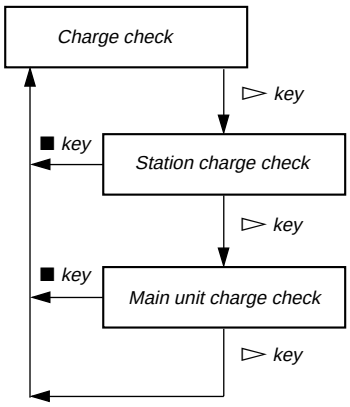
Enter the test mode. Then press the ▶▶| key, the |◀◀ key to enter the charge check mode.

Screen

```
Charge　チェック

(Charge check)
```

The characters in parenthesis (　) are not displayed.



Station charge check mode

- This mode checks the station charge operation.

Screen

```
Charge　チェック
   ステーションチャージチェック
    OFF
(Charge check)
   (Station charge check)
   (OFF)
```

The characters in parenthesis (　) are not displayed.

- The battery charge can be switched ON or OFF by pressing the battery existence/non-existence detect switch inside the battery case. To access the battery case, open the battery insertion slot on the right side of station.
- The CHARGE LED is lit when the battery existence/non-existence detect switch is set to ON.

Main unit charge check mode

- The simulated check of the charge operation of the main unit is performed by this mode.

Screen

```
Charge　チェック
   ホンタイ　チャージチェック
    OFF
(Charge check)
   (Main unit charge check)
   (OFF)
```

The characters in parenthesis (　) are not displayed.

- The battery charge can be switched ON or OFF by moving the RELEASE ➡ slide switch in the arrow direction.

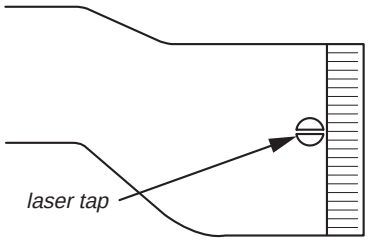
SECTION 5
ELECTRICAL ADJUSTMENTS

Precautions for Checking Laser Diode Emission

To check the emission of the laser diode during adjustments, never view directly from the top as this may lose your eye-sight.

Precautions for Use of optical pick-up (KMS-280A/J2N)

As the laser diode in the optical pick-up is easily damaged by static electricity, solder the laser tap of the flexible board when using it. Before disconnecting the connector, desolder first. Before connecting the connector, be careful not to remove the solder. Also take adequate measures to prevent damage by static electricity. Handle the flexible board with care as it breaks easily.



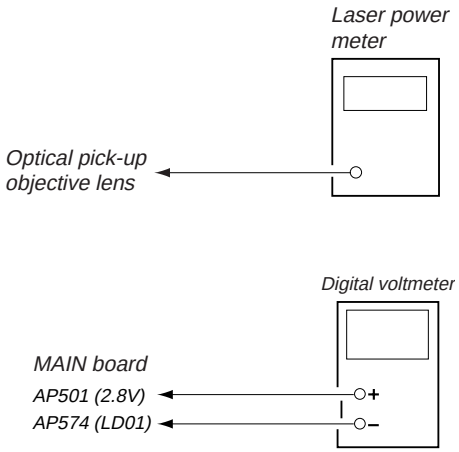
Optical pick-up flexible board

Precautions for Adjustments

1) Use the test mode when performing adjustments. After completing the adjustments, exit the test mode.
2) Use the following tools and measuring devices.
   - Check Disc (CD) TDYS-1 (Parts No. 4-963-646-01)
   - Pre-recorded MO disc PTDM-1 (Parts No. J-2501-054-A)
   - Laser power meter LPM-8001 (Parts No. J-2501-046-A)
   - Oscilloscope (Bandwidth 40 MHz or higher. Calibrate the probes before measurement.)
   - Digital voltmeter
3) As to power supply, supply DC 3.7V using the BATTERY terminal unless otherwise specified.
4) Switch and control knob position : HOLD switch ....OFF

Laser Power Check

Connection:

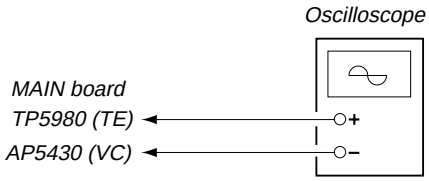


Adjusting Method:

1. Enter the servo test mode (mode: 000) of the adjustment mode of the test mode.
2. Press the ► key, then press the VOLUME + key and VOLUME – key to enter the laser power adjustment mode (mode: 020).
3. Press the ⏮ key to move the optical pickup to the most inner circumference.
4. Open the cabinet lid and set the laser power meter on top of the objective lens of the optical pickup.
5. Press the ► key to enter the laser CD/MO read adjustment mode (mode: 021).
6. Check that the laser power meter reading is 0.85 ±0.08 mW.
7. Check that the voltage between AP574 (LD01) and AP501 (2.8 V), is 44 mV or less.
8. Press the ► key to enter the laser MO write adjustment mode (mode: 022).
9. Check that the laser power meter reading is 6.8 ±0.68 mW.
10. Press the ❚❚ key to set the adjustment data.
11. Check that the voltage between AP574 (LD01) and AP501 (2.8 V), is 88 mV or less.
12. Press the ■ key.
13. Exit the test mode.

MO Traverse Adjustment

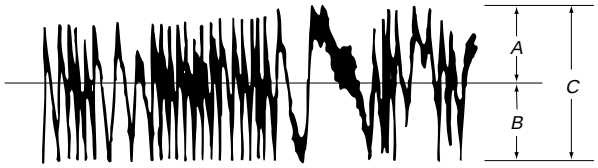
Connection:



Adjusting Method:

1. Enter the servo test mode (mode: 000) of the adjustment mode of the test mode.
2. Press the ► key, then press the VOLUME + key and VOLUME – key to enter the MO test mode (mode: 030).
3. Press the ⏮ key and the ⏭ key to move the optical pickup to almost center of an MO disc.
4. Insert a commercial available MO disc.
5. Press the ► key to enter the MO playback EF balance adjustment mode (mode: 032) after passing through the focus search ON (mode: 031).
6. Press the ❚❚ key to perform the automatic adjustment and check that the traverse waveform is vertically symmetrical.
7. Slide the REC key to enter the MO record EF balance adjustment mode (mode: 034).
8. Press the ❚❚ key to perform the automatic adjustment and check that the traverse waveform is vertically symmetrical.

(Traverse waveform)



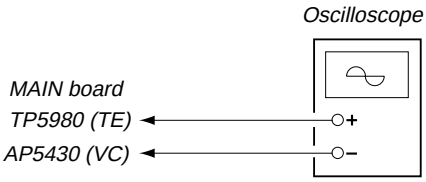
Specification: A = B, C ≧ 1.6 Vp-p

9. Check that the traverse level is 1.6 Vp-p or more.
10. Press the ■ key.
11. Exit the test mode.

Note: When a pre-recorded disc is used for this adjustment, all data that has already been recorded on a disc will be erased.

Low Reflection CD Traverse Adjustment

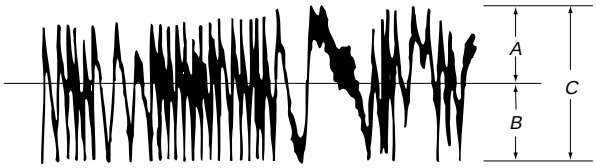
Connection:



Adjusting Method:

1. Enter the servo test mode (mode: 000) of the adjustment mode of the test mode.
2. Press the ► key, then press the VOLUME + key and VOLUME – key to enter the low reflection CD traverse adjustment mode (mode: 040).
3. Insert a commercial available MO disc.
4. Press the ► key to enter the low reflection CD EF balance adjustment mode (mode: 042) after passing through the low reflection CD focus search ON (mode: 041).
5. Press the ❚❚ key to perform the automatic adjustment and check that the traverse waveform is vertically symmetrical.

(Traverse waveform)

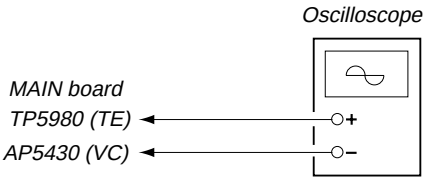


Specification: A = B, C ≧ 0.9 Vp-p

6. Check that the traverse level is 0.9 Vp-p or more.
7. Press the ■ key.
8. Exit the test mode.

CD Traverse Adjustment

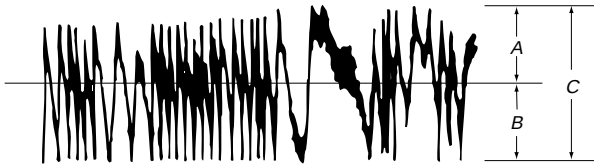
Connection:



Adjusting Method:

1. Enter the servo test mode (mode: 000) of the adjustment mode of the test mode.
2. Press the ► key, then press the VOLUME + key and VOLUME – key to enter the CD test mode (mode: 050).
3. Press the ⏮ key and the ⏭ key to move the optical pickup to almost center of a CD disc.
4. Insert a check disc (CD) TDYS-1.
5. Press the ► key to enter the CD EF balance adjustment mode (mode: 052) after passing through the CD focus search ON (mode: 051).
6. Press the ⏸ key to perform the automatic adjustment and check that the traverse waveform is vertically symmetrical.

(Traverse waveform)

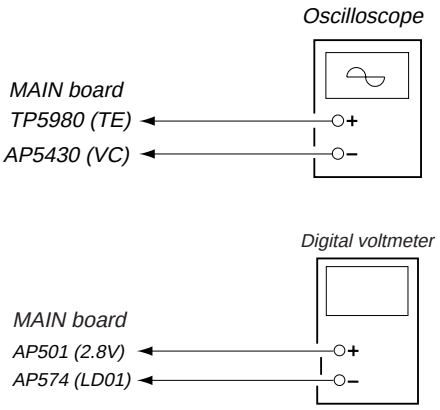


Specification: A = B, C ≧ 1.6 Vp-p

7. Check that the traverse level is 1.6 Vp-p or more.
8. Exit the test mode.

CD RF Level Check

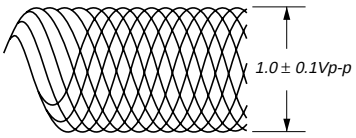
Connection:



Adjusting Method:

1. Enter the servo test mode (mode: 000) of the adjustment mode of the test mode.
2. Press the ► key, then press the VOLUME + key and VOLUME – key to enter the CD test mode (mode: 050).
3. Press the ⏮ key and the ⏭ key to move the optical pickup to almost center of a CD disc.
4. Insert a check disc (CD) TDYS-1.
5. Press the ► key to enter the CD EF balance adjustment mode (mode: 052) after passing through the CD focus search ON (mode: 051).
6. Press the ► key to enter the CD ABCD level adjustment mode (mode: 053).
7. Press the ⏸ to perform the automatic adjustment and check that the RF level is 1.0 ±0.1 Vp-p.

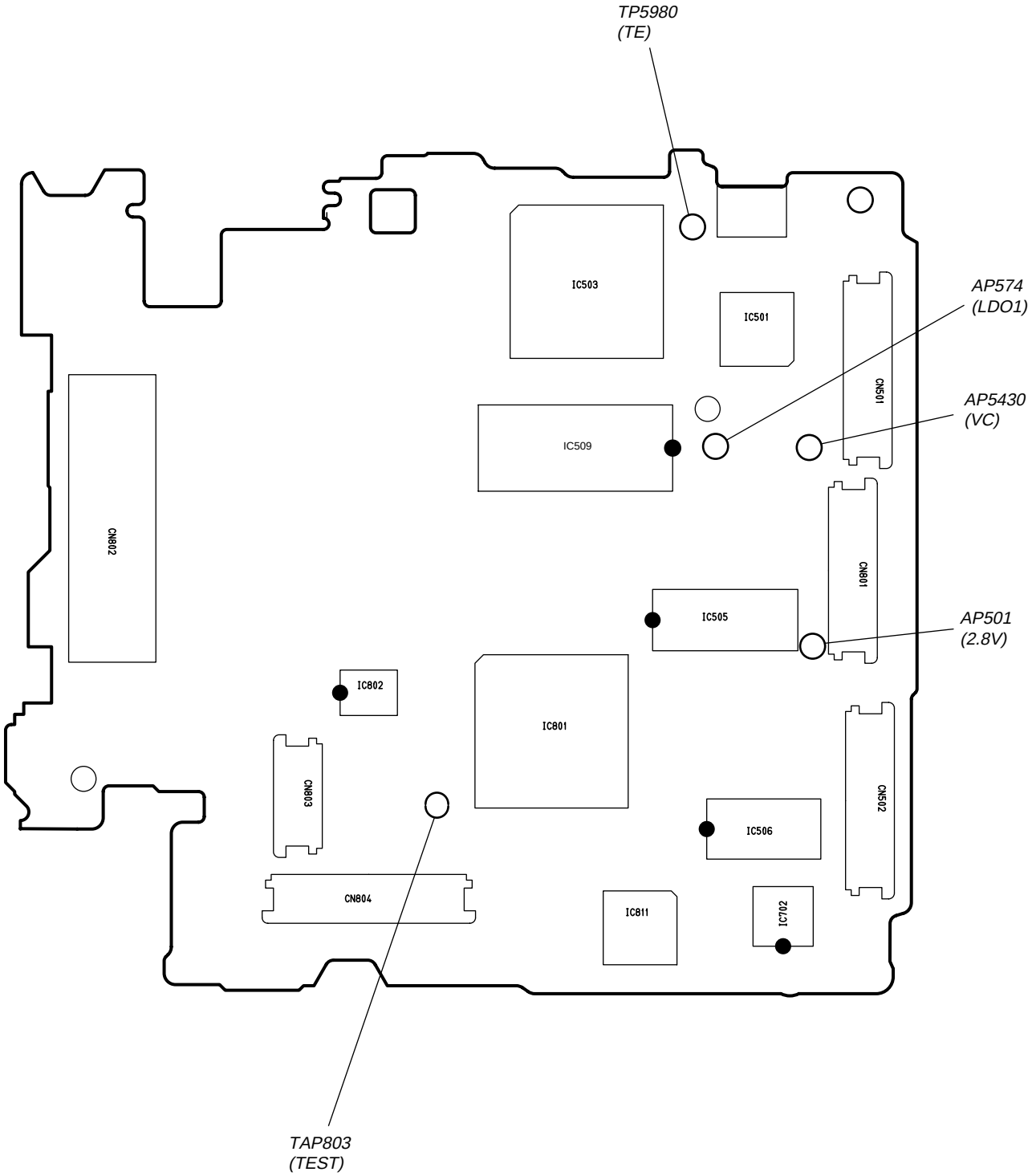
(RF waveform)



8. Check that the voltage between AP574 (LD01) and AP501 (2.8 V) is 44 mV or less.
9. Press the ■ key.
10. Exit the test mode.

- **CONNECTION POINTS LOCATION DIAGRAM**

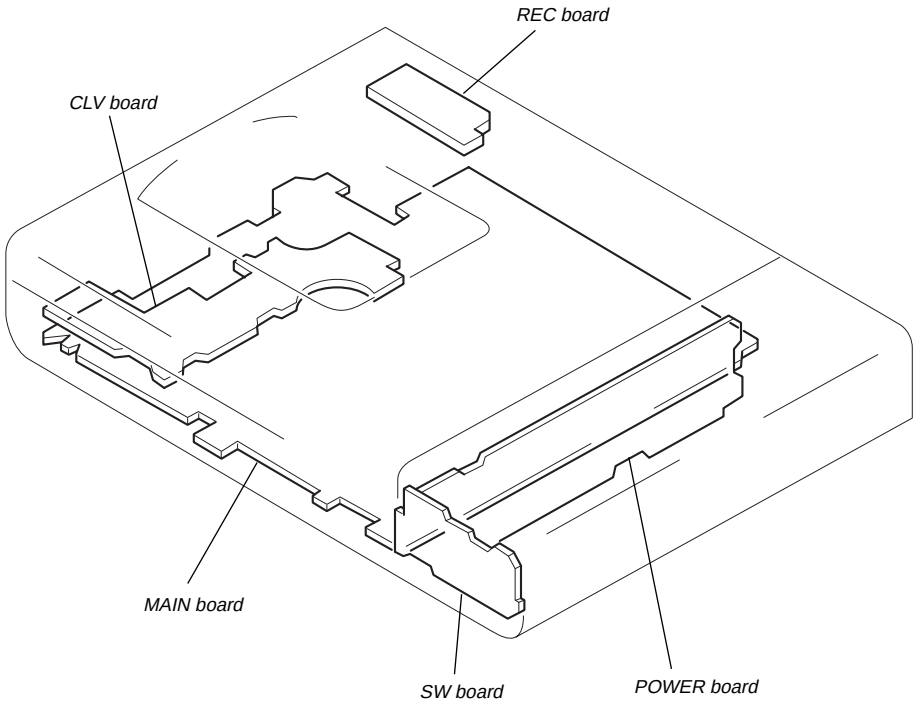
[MAIN BOARD] (CONDUCTOR SIDE)



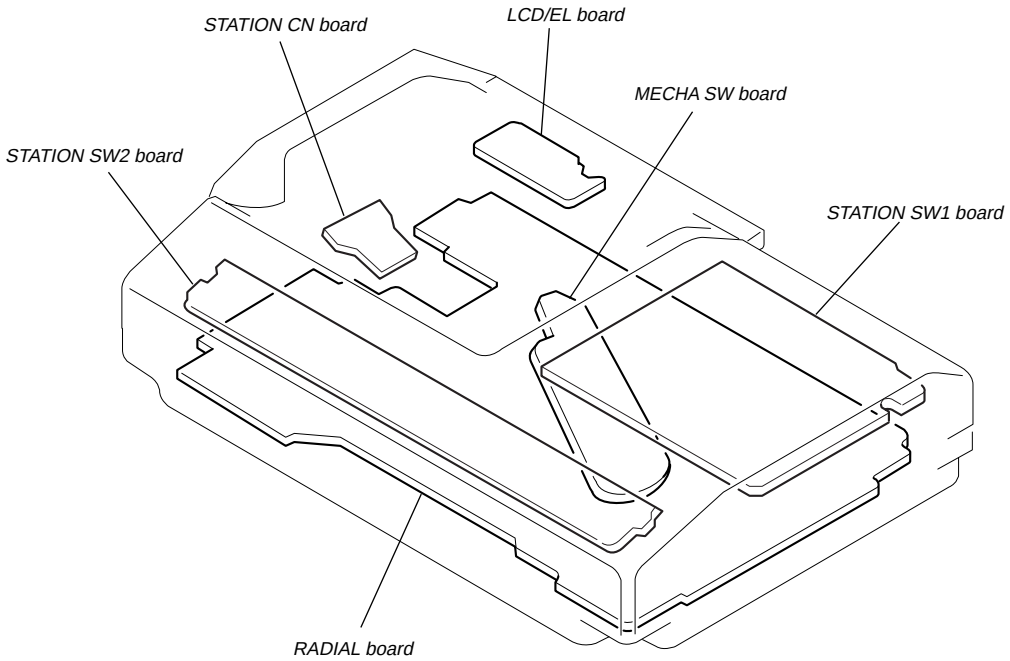
SECTION 6
DIAGRAMS

6-1. CIRCUIT BOARDS LOCATION

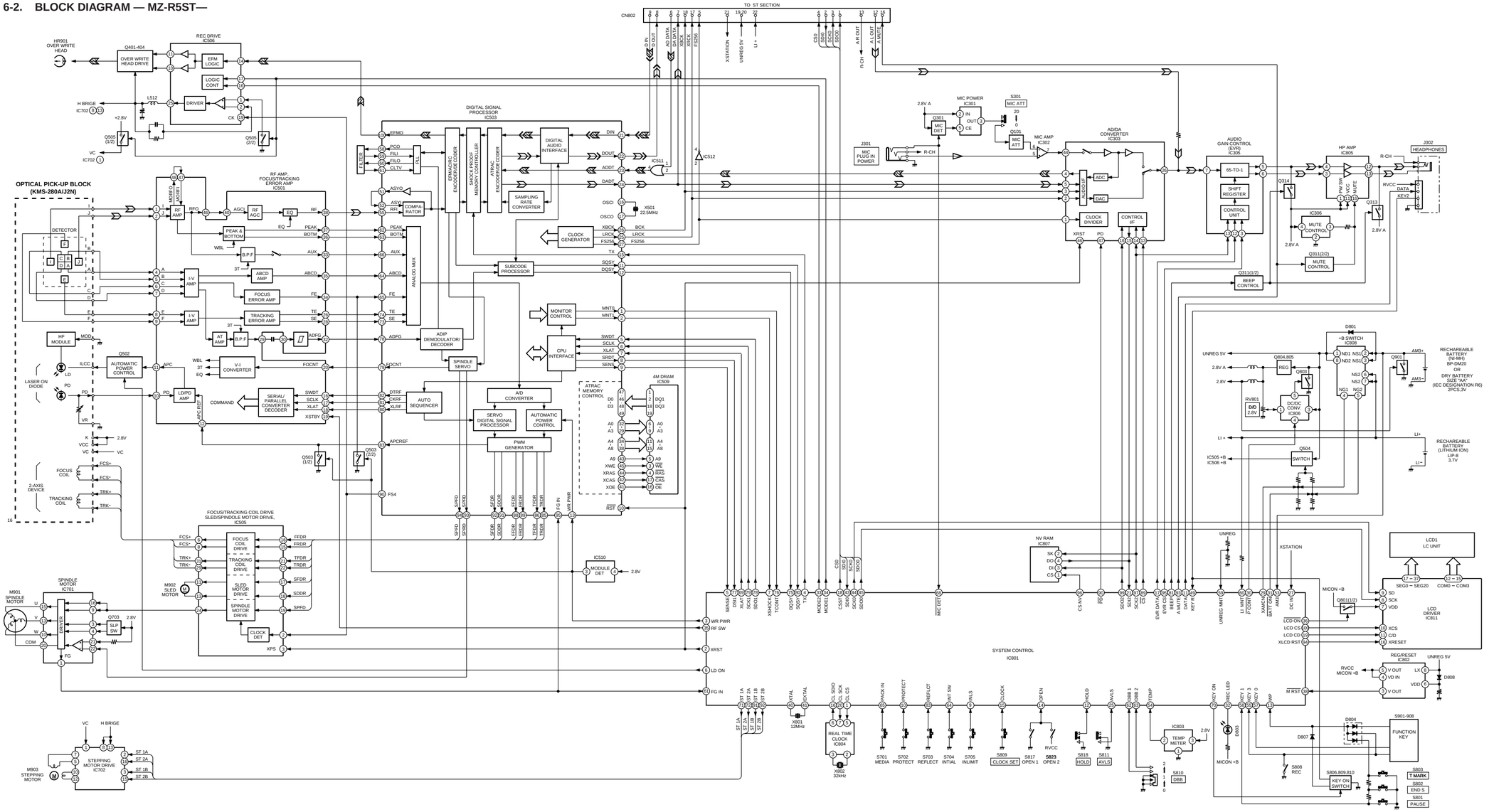
• MZ-R5ST



• MZS-R5ST

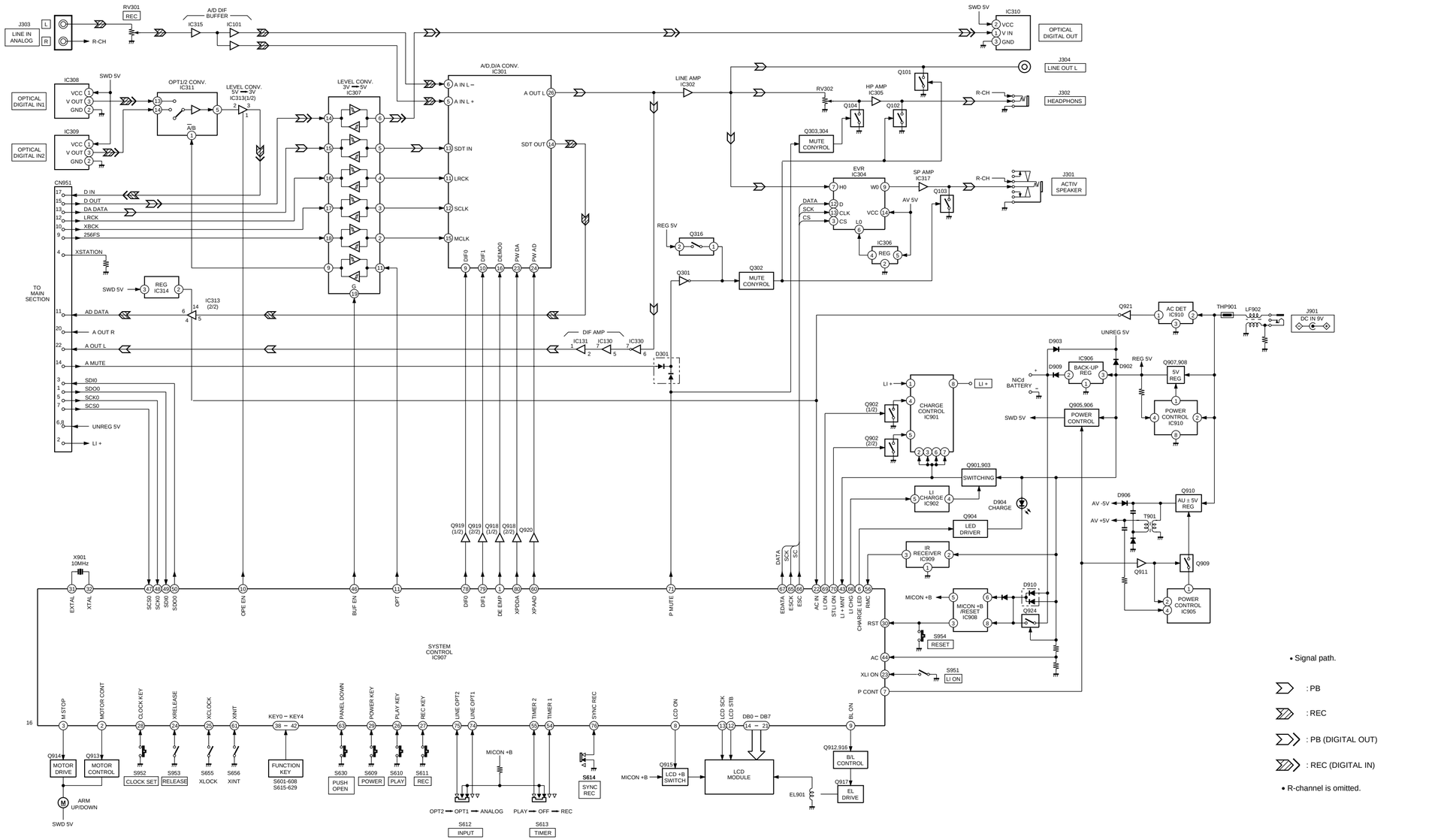


6-2. BLOCK DIAGRAM — MZ-R5ST—



- Signal path.
- : PB
- : REC
- : PB (DIGITAL OUT)
- : REC (DIGITAL IN)
- : MIC
- R-channel is omitted.

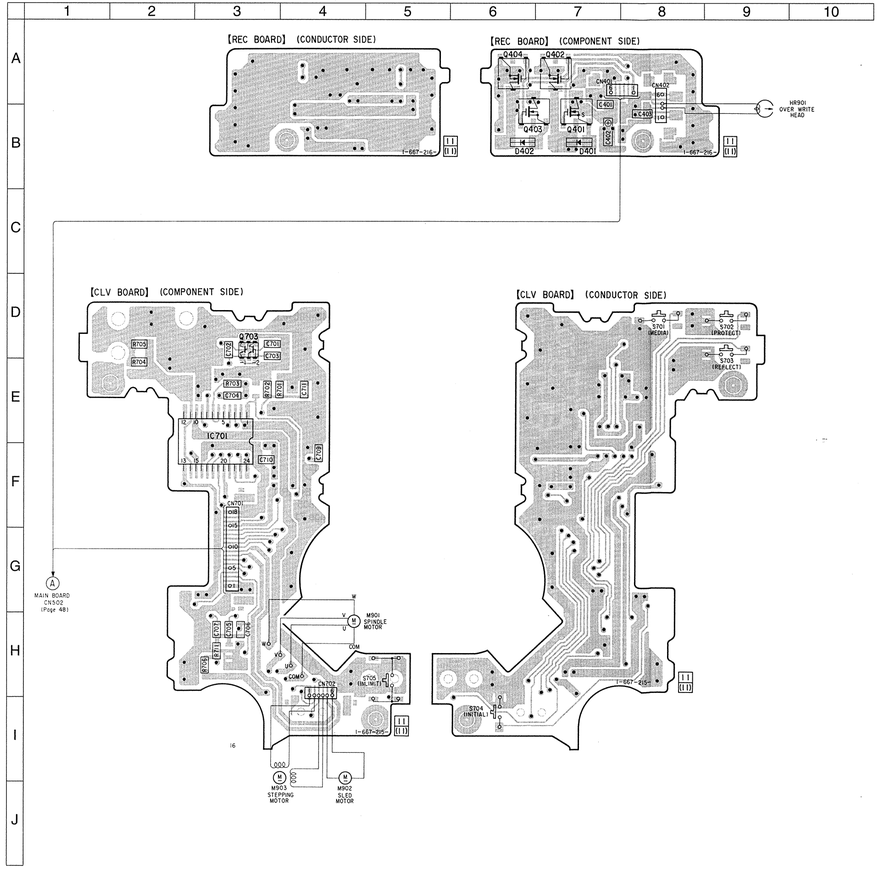
6-3. BLOCK DIAGRAM — MZS-R5ST—



- Signal path.
- : PB
- : REC
- : PB (DIGITAL OUT)
- : REC (DIGITAL IN)
- R-channel is omitted.

6-4. PRINTED WIRING BOARD — MD MECHANISM SECTION —

• Refer to page 34 for Circuit Boards Location.



• Semiconductor Location

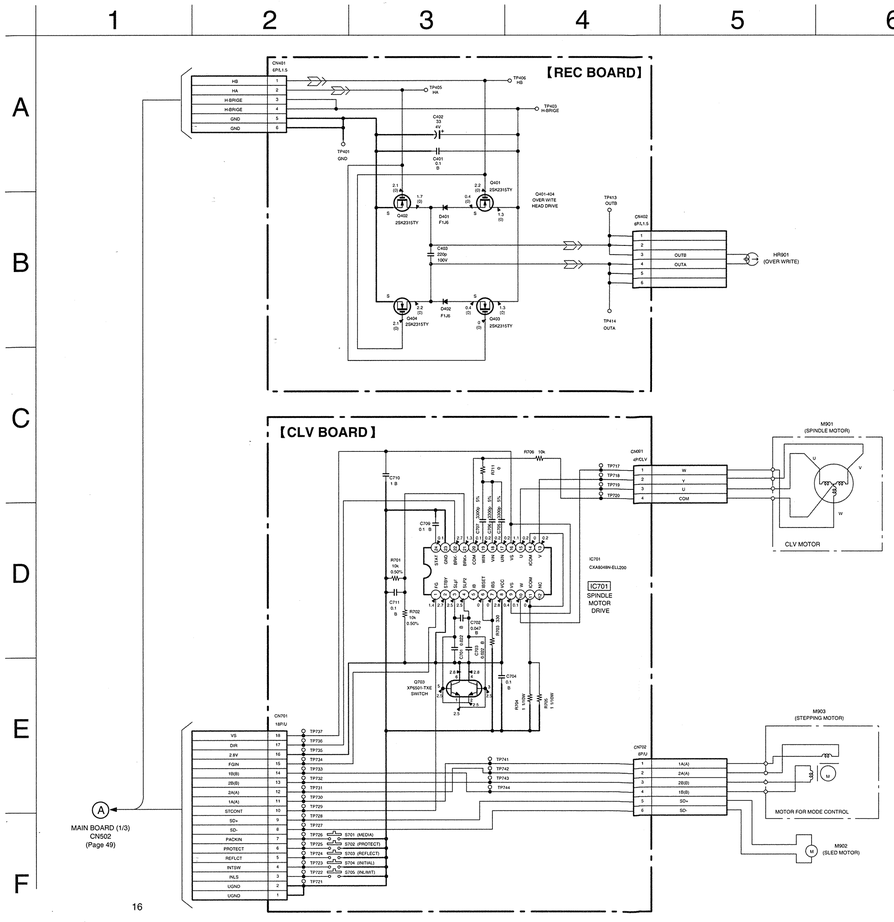
Ref. No.	Location
D401	B-7
D402	B-6
IC701	E-3
Q401	B-7
Q402	A-7
Q403	B-6
Q404	A-6
Q703	D-3

Note:
- ○——: parts extracted from the component side.
- ●: Through hole.
- ▒▒: Pattern from the side which enables seeing. (The other layers' patterns are not indicated.)

Caution:
Pattern face side: (Conductor Side) Parts on the pattern face side seen from the pattern face are indicated.
Parts face side: (Component Side) Parts on the parts face side seen from the parts face are indicated.

6-5. SCHEMATIC DIAGRAM — MD MECHANISM SECTION —

• Refer to page 77 for IC Block Diagrams.



Note:
- All capacitors are in μF unless otherwise noted. pF: μμF 50 WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and ¼ W or less unless otherwise specified.
- ▬▬: B+ Line.
- Power voltage is dc 4.5 V and fed with regulated dc power supply from battery terminal.
- Voltages are dc with respect to ground under no-signal (detuned) conditions.
- Voltages are taken with a VOM (Input impedance 10 MΩ). Voltage variations may be noted due to normal production tolerances.
- Signal path.
  ⋙: REC

6-6. PRINTED WIRING BOARD — MD MAIN SECTION —

• Refer to page 34 for Circuit Boards Location.

• **Semiconductor Location**

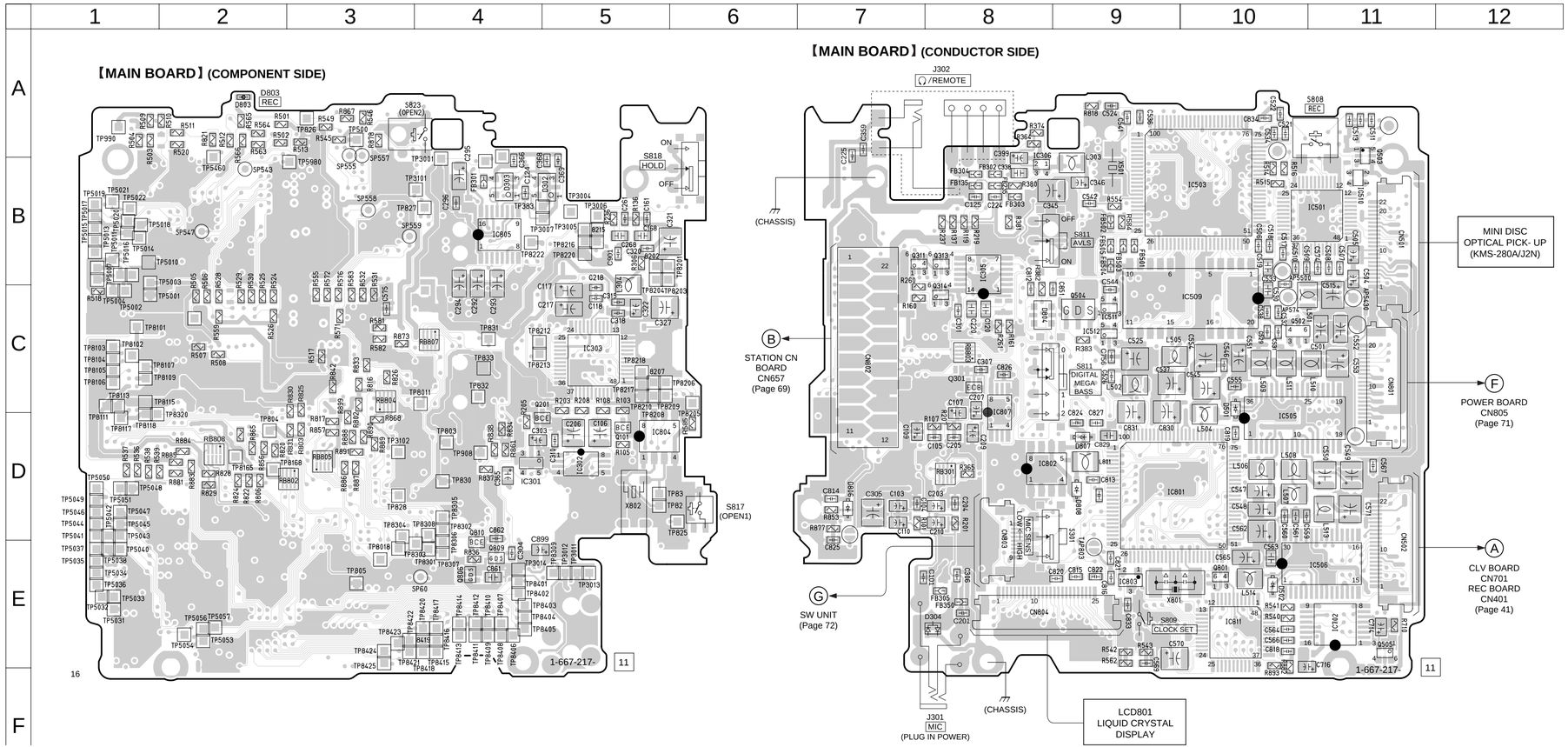
Ref. No.	Location
D302	B-5
D303	B-4
D304	E-8
D501	D-10
D502	E-10
D803	A-2
D804	C-8
D806	D-7
D807	D-9
D808	D-9
IC301	D-4
IC302	D-5
IC303	C-5
IC305	B-8
IC306	A-8
IC501	B-11
IC503	B-10
IC505	D-10
IC506	E-11
IC509	C-10
IC510	B-11
IC511	C-9
IC512	C-9
IC702	E-11
IC801	D-9
IC802	D-8
IC803	E-9
IC804	D-5
IC805	B-4
IC807	D-8
IC811	E-10
Q101	D-5
Q201	D-4
Q301	C-8
Q311	B-7
Q313	B-8
Q314	C-8
Q502	C-10
Q503	A-11
Q504	C-9
Q505	E-11
Q801	E-10
Q806	E-4
Q809	E-4
Q810	E-4

Note:

- ◇——— : parts extracted from the component side.
- ——— : parts extracted from the conductor side.
- △ : internal component.
- The MAIN board has the four-layer structure. However the 2nd and the 3rd layer patterns are not shown.
- ▨ : Pattern from the side which enables seeing.

(The other layers' patterns are not indicated.)

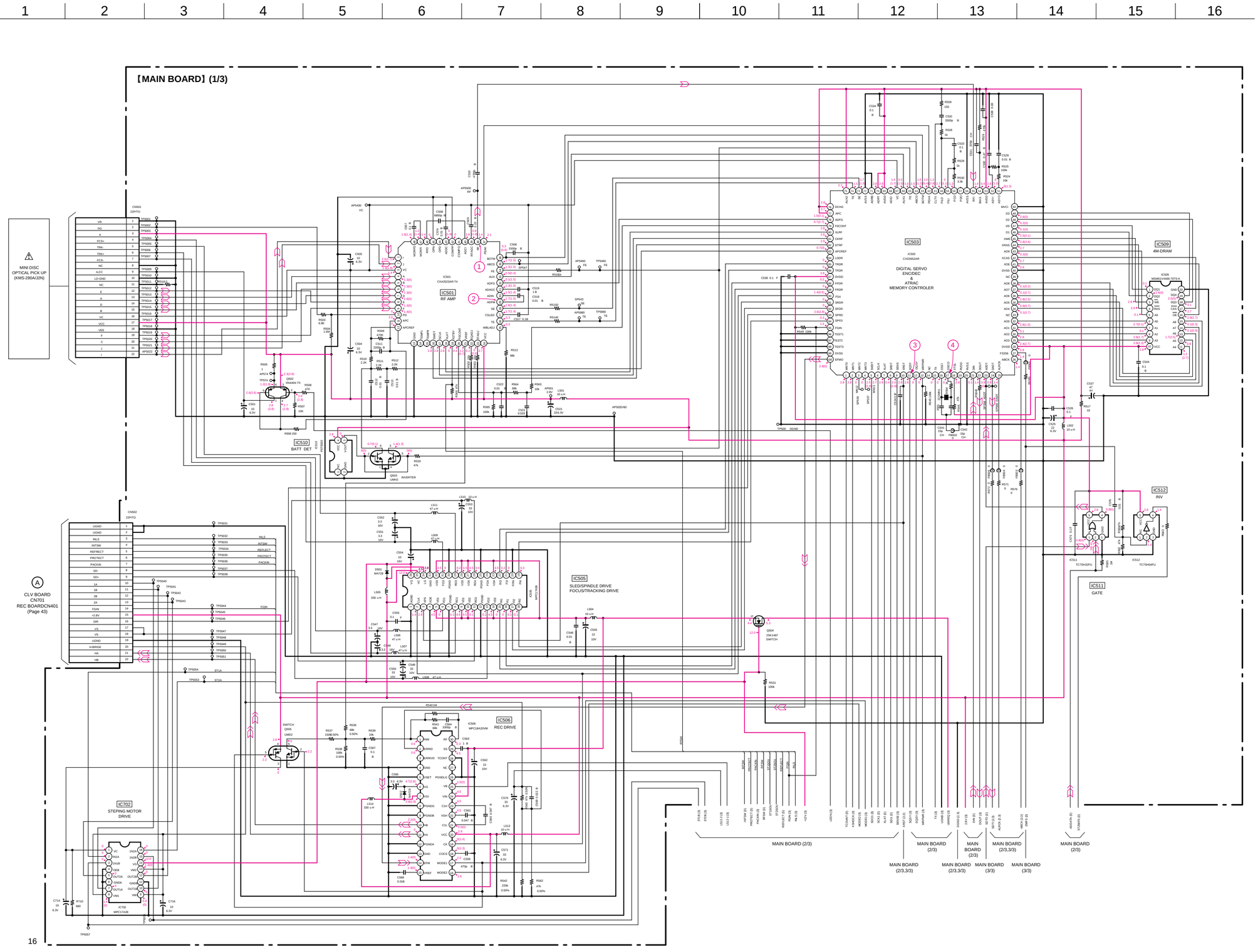
Caution:
Pattern face side: Parts on the pattern face side seen from (Conductor Side) the pattern face are indicated.
Parts face side: Parts on the parts face side seen from (Component Side) the parts face are indicated.



6-7. SCHEMATIC DIAGRAM — MD MAIN SECTION (1/3) —

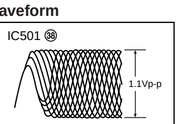
• Refer to page 75 for IC Block Diagrams.

【MAIN BOARD】(1/3)



• **Waveform**

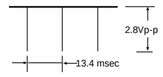
① IC501 ㊳



② IC501 ㉙

Approx. 0.5Vp-p

③ IC503 ⑪



④ IC503 ⑰

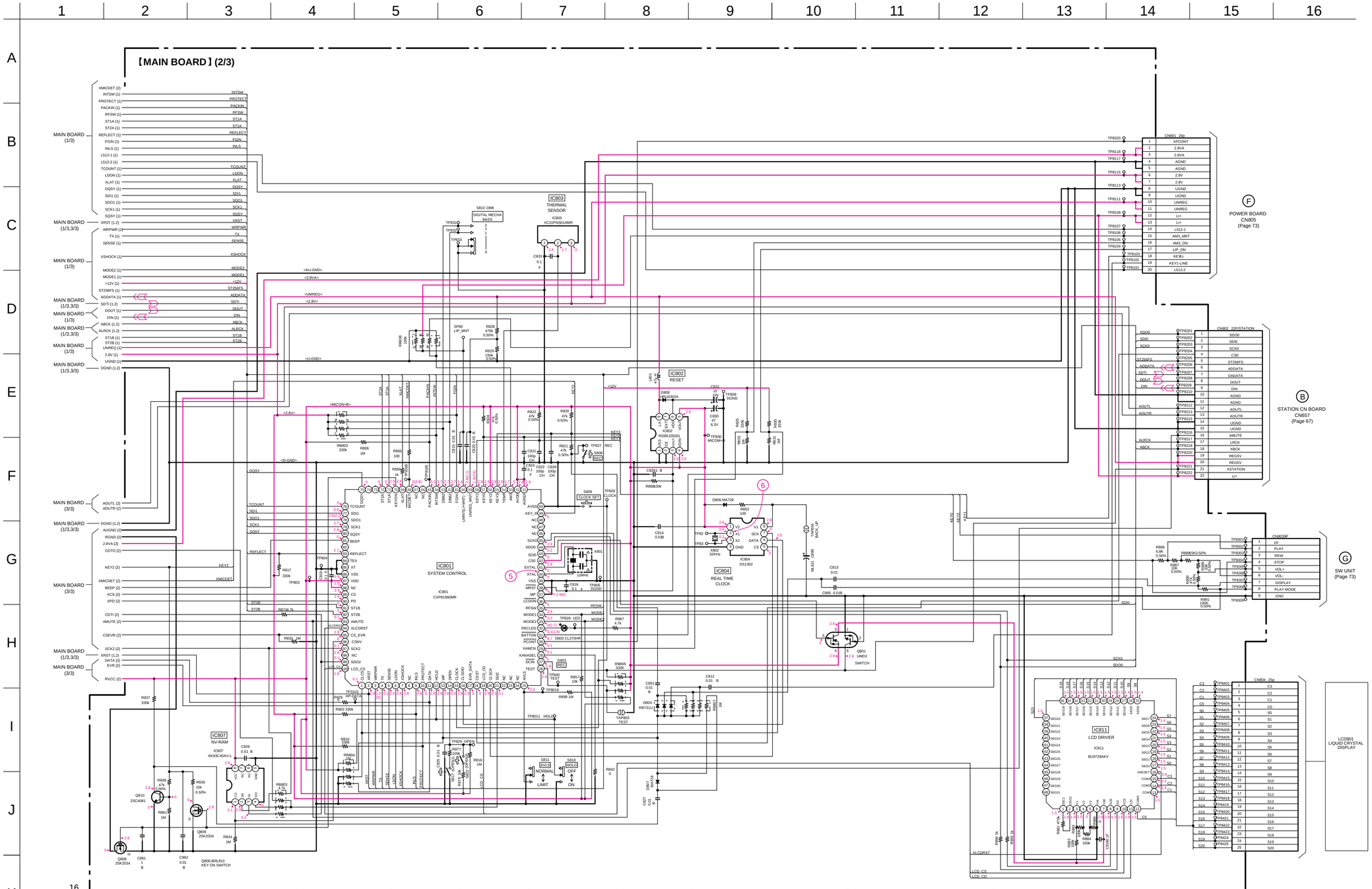
Note:
- All capacitors are in μF unless otherwise noted. pF: μμF 50 WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and ¼ W or less unless otherwise specified.

Note: The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

- ▬▬ : B+ Line.
- Power voltage is dc 4.5 V and fed with regulated dc power supply from battery terminal.
- Voltages and waveforms are dc with respect to ground under no-signal (detuned) conditions.
  no mark : PB
  ( ) : REC
- Voltages are taken with a VOM (Input impedance 10 MΩ). Voltage variations may be noted due to normal production tolerances.
- Waveforms are taken with a oscilloscope.
  Voltage variations may be noted due to normal production tolerances.
- Circled numbers refer to waveforms.
- Signal path.
  ≫ : PB
  ≫ : REC

6-8. SCHEMATIC DIAGRAM — MD MAIN SECTION (2/3) —

• Refer to page 75 for IC Block Diagrams.


【MAIN BOARD】(2/3)
IC801
SYSTEM CONTROL
IC801
CXP81960MR
IC802
RESET
IC803
THERMAL SENSOR
IC803
XC3IPVS01AMR
IC804
REAL TIME CLOCK
IC804
DS1302
IC807
NV-RAM
IC807
AK93C45AV-L
IC811
LCD DRIVER
IC811
BU9728AKV
SB10 DBB
DIGITAL MECHA BASS
S809
CLOCK SET
S811
AVLS
NORMAL
LIMIT
S818
HOLD
OFF
ON
TP827 REC
S808
REC
Q803
REC
Q801
UMC2
SWITCH
Q810
2SC4081
Q809
2SK2034
Q806
2SK2034
Q806,809,810
KEY ON SWITCH
X801
12MHz
X802
32KHz
D806 MA728
D803 CL270HR
D804 RB721W
CN801 20p
CN802 22P/STATION
CN804 25p
CN803P
POWER BOARD CN805 (Page 73)
STATION CN BOARD CN657 (Page 67)
SW UNIT (Page 73)
LCD801 LIQUID CRYSTAL DISPLAY
MAIN BOARD (1/3)
MAIN BOARD (1/3,3/3)
MAIN BOARD (3/3)
MAIN BOARD (1/3,3/3)
MAIN BOARD (1/3)
MAIN BOARD (1/3,3/3)
MAIN BOARD (1/3)
MAIN BOARD (1/3,3/3)
MAIN BOARD (3

6-9. SCHEMATIC DIAGRAM — MD MAIN SECTION (3/3) —

• Refer to page 77 for IC Block Diagrams.

【MAIN BOARD】(3/3)

IC301 REG.

IC302 MIC AMP

IC303 AD/DA-CONVERTER

IC305 AUDIO GAIN CONTROL

IC306 MUTE CONTROL

IC805 HP AMP

J301 MIC (PLUG IN POWER)

J302 REMOTE

(CHASSIS)

MAIN BOARD (1/3)

MAIN BOARD (2/3)

MAIN BOARD (2/3)

Note:

- All capacitors are in µF unless otherwise noted. pF: µµF 50 WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4 W or less unless otherwise specified.
- ▬▬ : B+ Line.
- Power voltage is dc 4.5 V and fed with regulated dc power supply from battery terminal.
- Voltages are dc with respect to ground under no-signal (detuned) conditions.
- Voltages are taken with a VOM (Input impedance 10 MΩ). Voltage variations may be noted due to normal production tolerances.
  no mark : PB
  ( ) : REC
- Signal path.
  ▷▷ : PB
  ▷▷ : REC

6-10. PRINTED WIRING BOARD — RADIAL SECTION —

• Refer to page 34 for Circuit Boards Location.

• Semiconductor Location

Ref. No.	Location	Ref. No.	Location
D301	E-16	IC906	D-16
D310	F-2	IC907	C-14
D320	D-12	IC908	D-3
D321	D-12	IC909	G-11
D901	C-11	IC910	B-2
D902	D-15		
D903	D-15	Q101	E-13
D904	C-10	Q102	E-16
D905	B-17	Q103	E-16
D906	B-14	Q104	E-15
D907	B-13	Q201	D-13
D908	D-15	Q202	D-16
D909	D-2	Q203	E-16
D910	D-15	Q204	E-16
		Q301	E-16
IC101	D-10	Q302	F-16
IC130	E-3	Q303	F-2
IC131	E-3	Q304	E-2
IC201	D-11	Q901	B-11
IC230	D-3	Q902	B-10
IC231	D-3	Q903	C-11
IC301	D-12	Q904	C-10
IC302	E-13	Q905	B-16
IC304	E-5	Q906	C-16
IC305	E-16	Q907	B-17
IC306	F-2	Q908	B-16
IC307	C-5	Q909	B-14
IC308	A-14	Q910	B-13
IC309	A-14	Q911	C-4
IC310	A-15	Q912	B-15
IC311	C-13	Q913	C-10
IC313	D-13	Q914	D-10
IC314	C-13	Q915	B-16
IC315	F-11	Q916	B-15
IC316	F-16	Q917	B-15
IC317	E-15	Q918	D-6
IC330	E-14	Q919	D-6
IC901	B-10	Q920	D-6
IC902	C-11	Q921	B-2
IC904	B-16	Q924	D-15
IC905	B-15		

Note:
- ⟷ : parts extracted from the component side.
- △ : internal component.
- ▨ : Pattern from the side which enables seeing.

(The other layers' patterns are not indicated.)

Caution:
Pattern face side: (Conductor Side) Parts on the pattern face side seen from the pattern face are indicated.
Parts face side: (Component Side) Parts on the parts face side seen from the parts face are indicated.

【RADIAL BOARD】(COMPONENT SIDE)

【MECHA SW BOARD】(COMPONENT SIDE)

【RADIAL BOARD】(CONDUCTOR SIDE)

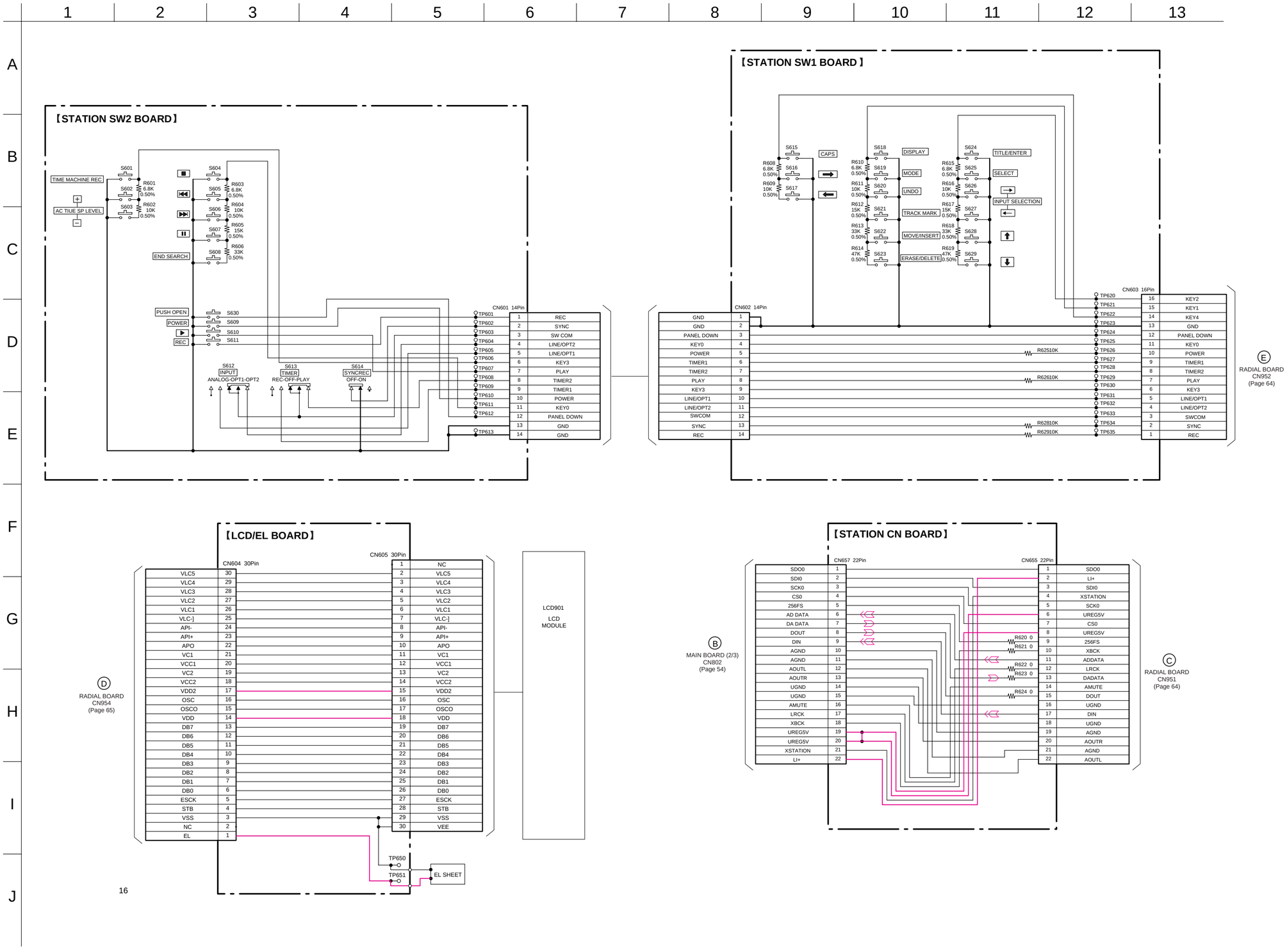
【MECHA SW BOARD】(CONDUCTOR SIDE)

6-11. SCHEMATIC DIAGRAM — RADIAL SECTION —

• Refer to page 78 for IC Block Diagrams.

【RADIAL BOARD】
STATION CN BOARD CN655 (Page 68)
RECHAGEABLE BATTERY(Nickel) SIZE "AA"(IEC DESIGNAION R6)PCS 3V
RECHAGEABLE BATTERY(Li-ION) LIP-3 3.7V
IC201 LINE AMP
IC101 LINE AMP
IC315 LINE AMP
IC301 AD,DA CONV.
IC302 AMP
IC304 EVR RV302 HEADPHONES LEVEL
IC305 HP AMP
IC306 REG
IC316 MUTE GEN
IC317 BUFFER
IC307 BUFFER
IC311 SELECTER
IC313 BUFFER
IC314 REG
IC330 AMP
IC130 AMP
IC131 AMP
IC230 AMP
IC231 AMP
IC901 CHARGE
IC902 CHARGE CONT
IC905 REG
IC910 REG
IC904 REG CONT
IC905 REG CONT
IC907 SYSTEM CONTROL
IC908 RESET
IC909 REMOTE SENSOR
IC906 RESISTOR
IC909 GP1U28Y
IC907 CXP84632-150
IC308 GP1F32R
IC309 GP1F32R
IC310 GP1F32T
IC311 SN74HC157ANS-E20
IC313 SN74LVC1G32APW-E20
IC315 (1/2) NJM2115M-TE2
IC315 (2/2) NJM2115M-TE2
IC201(1/2) NJM2115M-TE2
IC201(2/2) NJM2115M-TE2
IC101(1/2) NJM2115M-TE2
IC101(2/2) NJM2115M-TE2
IC317 (1/2) NJM4556AM-TE2
IC317 (2/2) NJM4556AM-TE2
IC301 AK4520A
IC302 (1/2) NJM2115M-TE2
IC302 (2/2) NJM2115M-TE2
IC230 NJM2115V-TE2
IC231 NJM2115V-TE2
IC330 NJM2115V-TE2
IC130 NJM2115V-TE2
IC131 NJM2115V-TE2
IC303(1/2) NJM4556AM-TE2
IC303(2/2) NJM4556AM-TE2
IC305(1/2) NJM4556AM-TE2
IC305(2/2) NJM4556AM-TE2
IC306 2SC4213-AB-TE85L MUTE
IC307 2SC4213-AB-TE85L MUTE
IC308 2SC4213-AB-TE85L MUTE
IC309 2SC4213-AB-TE85L MUTE
IC310 2SC4213-AB-TE85L MUTE
IC311 2SC4213-AB-TE85L MUTE
IC901 FZ777PF
IC902 XC62EP4001MR
IC905 XC62FP3002PR
IC907 2SC4213-AB-TE85L BUFFER
IC908 RB402D-T146
IC909 GP1U28Y
IC910 2SB1121-R-TD REG
IC904 2SC1623-T1/SL6 REG
IC905 2SB1121-R-TD REG
IC905 REG CONT
IC907 2SC4213-AB-TE85L BUFFER
IC907 SYSTEM CONTROL
IC908 RESET
IC909 REMOTE SENSOR
IC906 RESISTOR
IC909 GP1U28Y
IC907 CXP84632-150
Q201 2SC4213-AB-TE85L
Q202 2SC4213-AB-TE85L
Q203 2SC4213-AB-TE85L
Q204 2SC4213-AB-TE85L
Q205 2SC4213-AB-TE85L
Q206 2SC4213-AB-TE85L
Q207 2SC4213-AB-TE85L
Q208 2SC4213-AB-TE85L
Q209 2SC4213-AB-TE85L
Q210 2SC4213-AB-TE85L
Q211 2SC4213-AB-TE85L
Q212 2SC4213-AB-TE85L
Q213 2SC4213-AB-TE85L
Q214 2SC4213-AB-TE85L
Q215 2SC4213-AB-TE85L
Q216 2SC4213-AB-TE85L
Q217 2SC4213-AB-TE85L
Q218 2SC4213-AB-TE85L
Q219 2SC4213-AB-TE85L
Q220 2SC4213-AB-TE85L

6-12. SCHEMATIC DIAGRAM — STATION CONTROL SECTION —

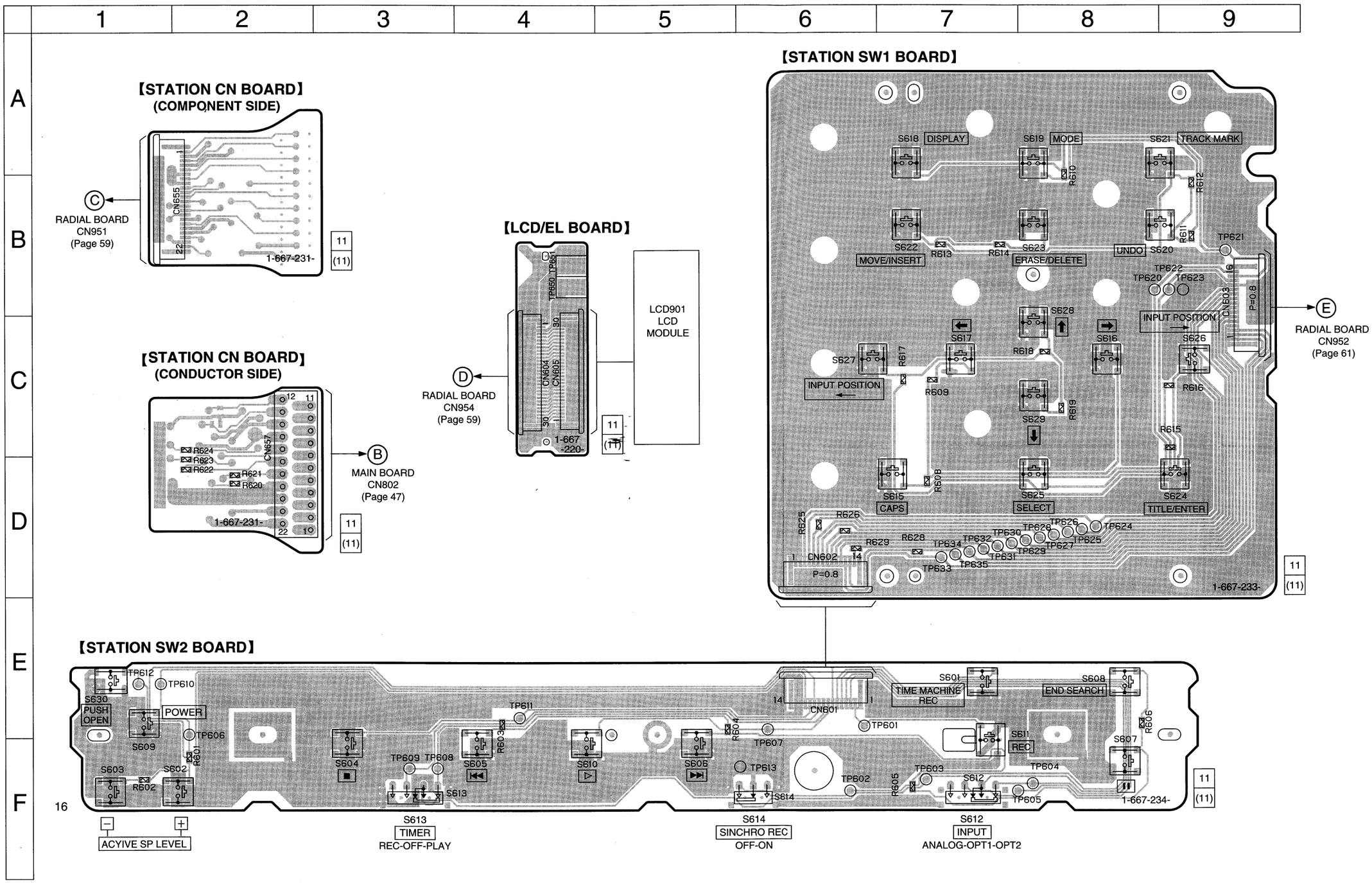


Note:

- All capacitors are in µF unless otherwise noted. pF: µµF 50 WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4 W or less unless otherwise specified.
- ▭ : panel designation.
- ▬ : B+ Line.
- Power voltage is dc 9 V and fed with regulated dc power supply from external power voltage jack.
- Signal path.
  - ▷ : PB
  - ▷▷ : REC

6-13. PRINTED WIRING BOARD — STATION CONTROL SECTION —

• Refer to page 34 for Circuit Boards Location.



Note:

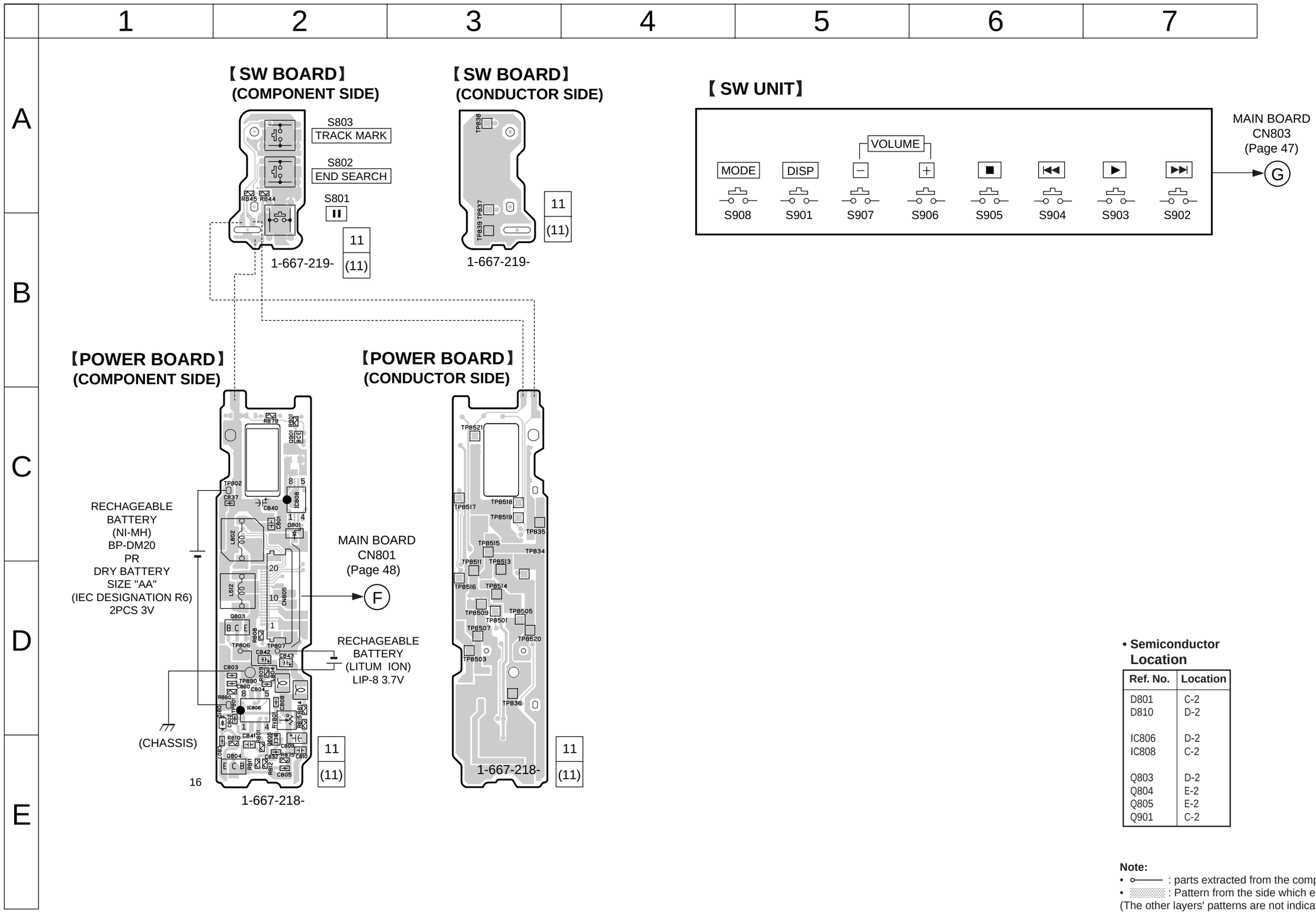
- ○——— : parts extracted from the component side.
- ▒▒▒ : Pattern from the side which enables seeing.

(The other layers' patterns are not indicated.)

Caution:	
Pattern face side: (Conductor Side)	Parts on the pattern face side seen from the pattern face are indicated.
Parts face side: (Component Side)	Parts on the parts face side seen from the parts face are indicated.

6-14. PRINTED WIRING BOARD — MD POWER SUPPLY, SWITCH SECTION —

• Refer to page 34 for Circuit Boards Location.



16

- **Semiconductor Location**

Ref. No.	Location
D801	C-2
D810	D-2
IC806	D-2
IC808	C-2
Q803	D-2
Q804	E-2
Q805	E-2
Q901	C-2

Note:

- ○——— : parts extracted from the component side.
- ▒▒▒▒ : Pattern from the side which enables seeing.

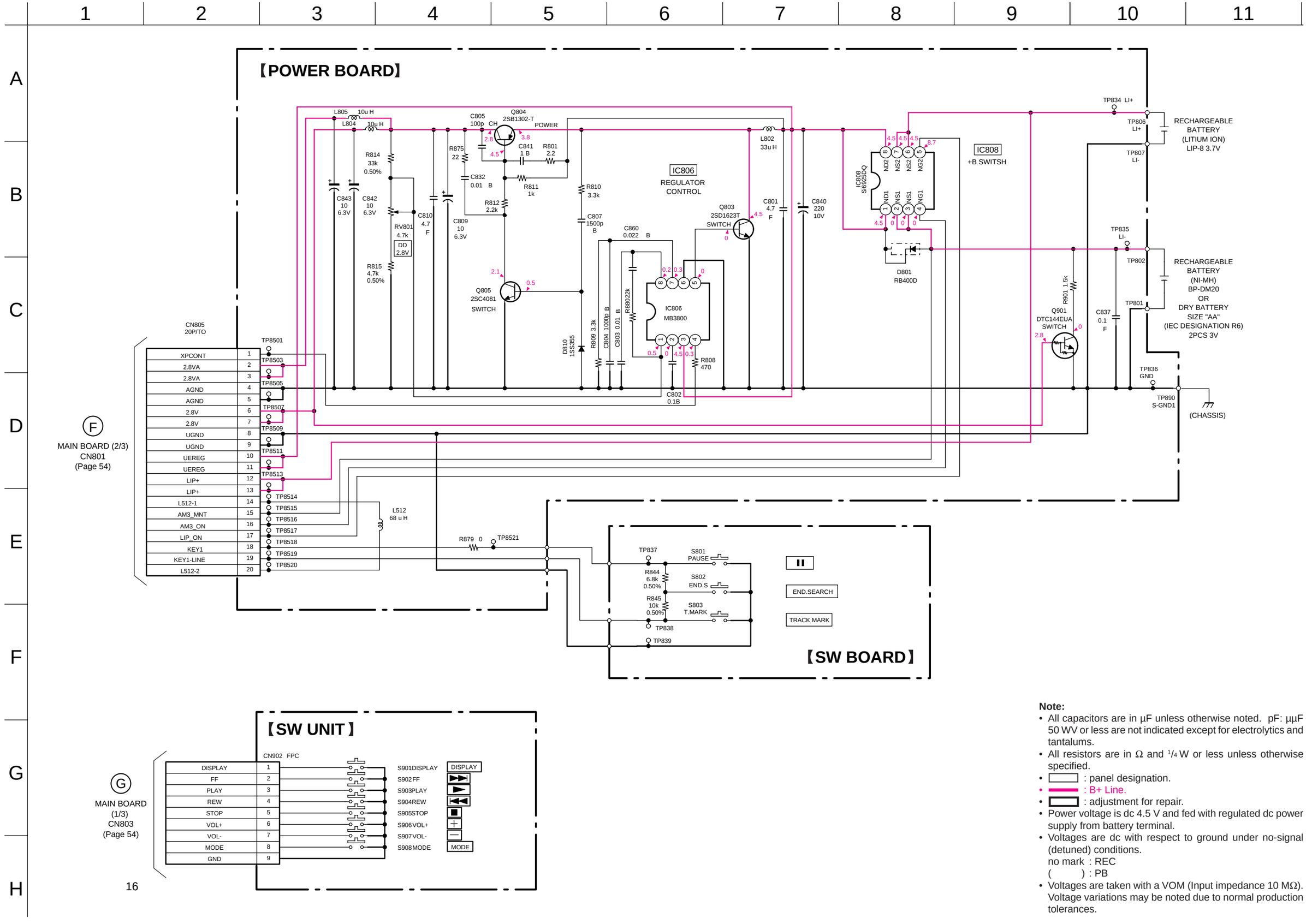
(The other layers' patterns are not indicated.)

Caution:

Pattern face side: (Conductor Side)	Parts on the pattern face side seen from the pattern face are indicated.
Parts face side: (Component Side)	Parts on the parts face side seen from the parts face are indicated.

6-15. SCHEMATIC DIAGRAM —MD POWER SUPPLY, SWITCH SECTION –

• Refer to page 75 for IC Block Diagrams.

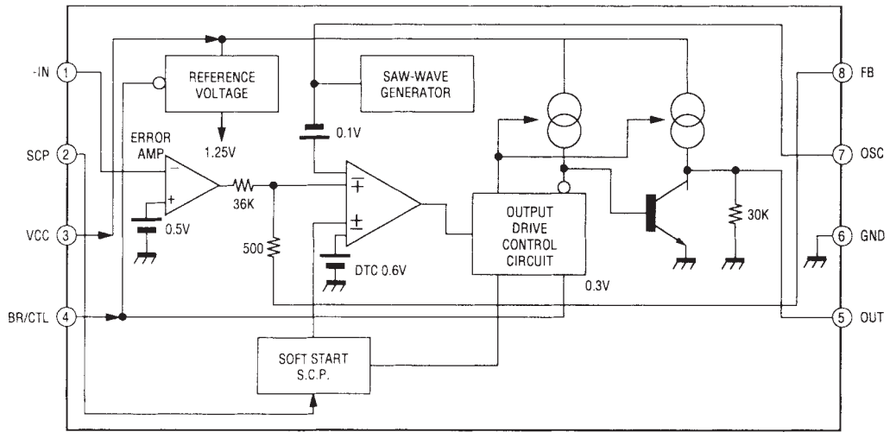


Note:

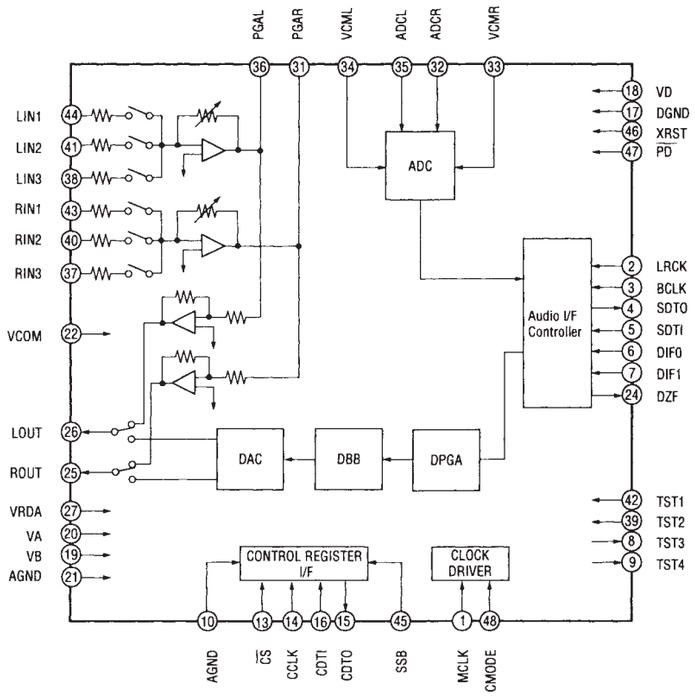
- All capacitors are in µF unless otherwise noted. pF: µµF 50 WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4 W or less unless otherwise specified.
- ▭ : panel designation.
- ▬ : B+ Line.
- ▭ : adjustment for repair.
- Power voltage is dc 4.5 V and fed with regulated dc power supply from battery terminal.
- Voltages are dc with respect to ground under no-signal (detuned) conditions.
  no mark : REC
  ( ) : PB
- Voltages are taken with a VOM (Input impedance 10 MΩ). Voltage variations may be noted due to normal production tolerances.

6-16. IC BLOCK DIAGRAMS — MD SECTION —

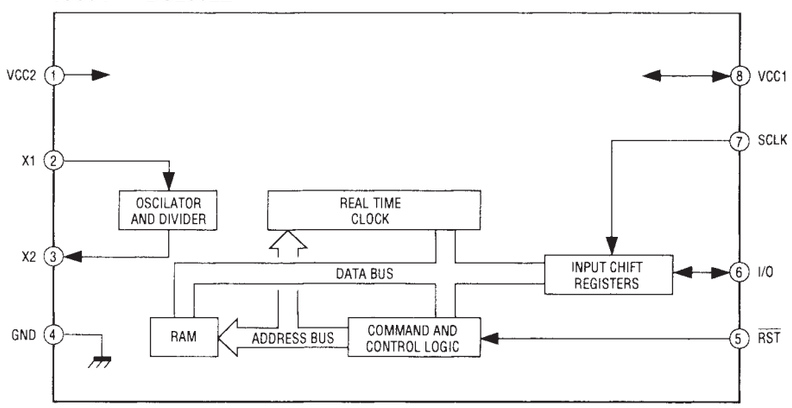
IC806 MB3800PNF



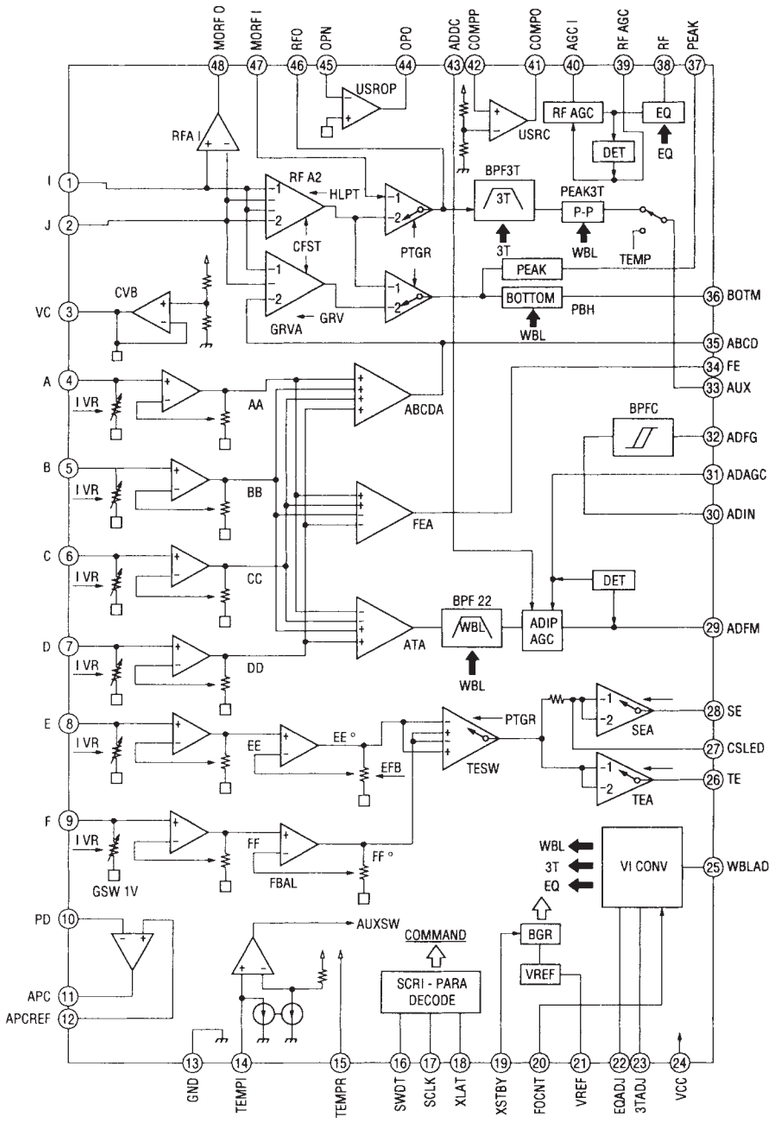
IC303 AK4515-VQ



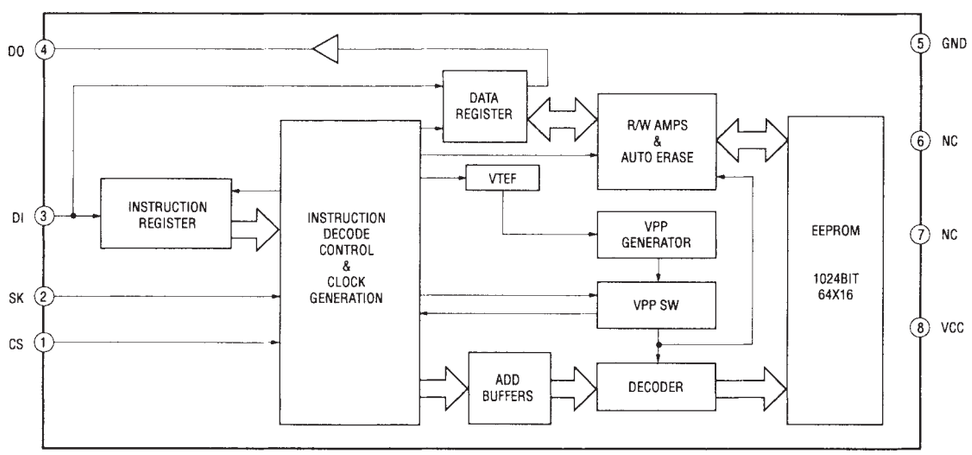
IC804 DS1302Z



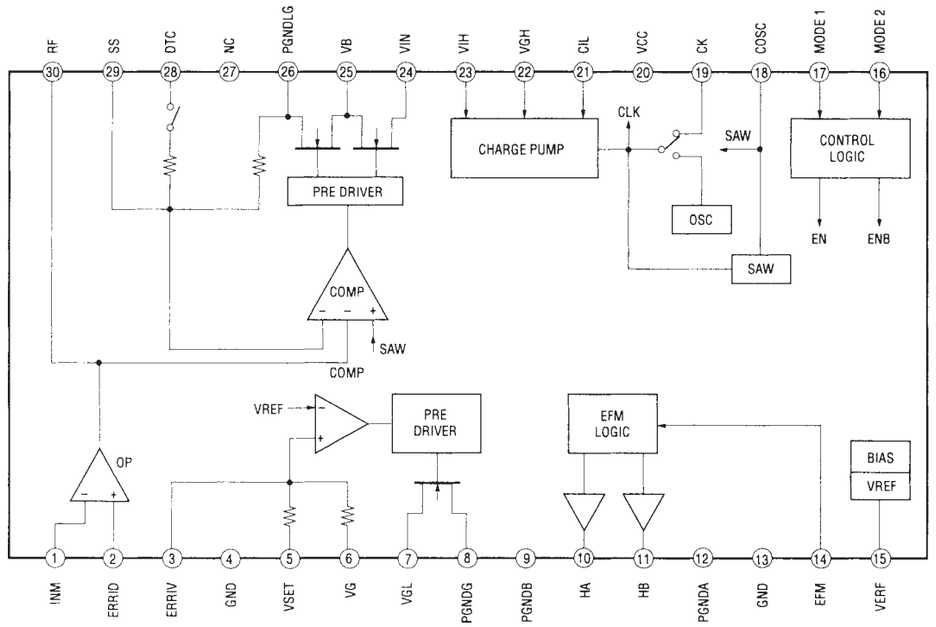
IC501 CXA2523AR



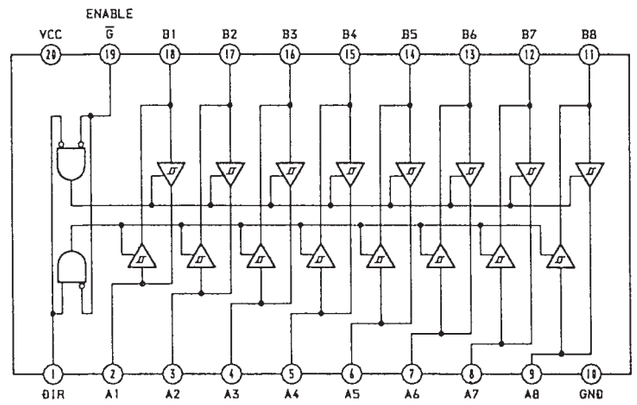
IC807 AK93C45AV-L



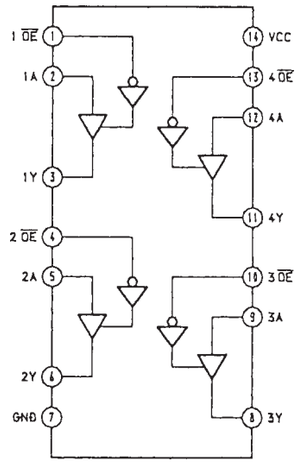
IC506 MPC18A20VM



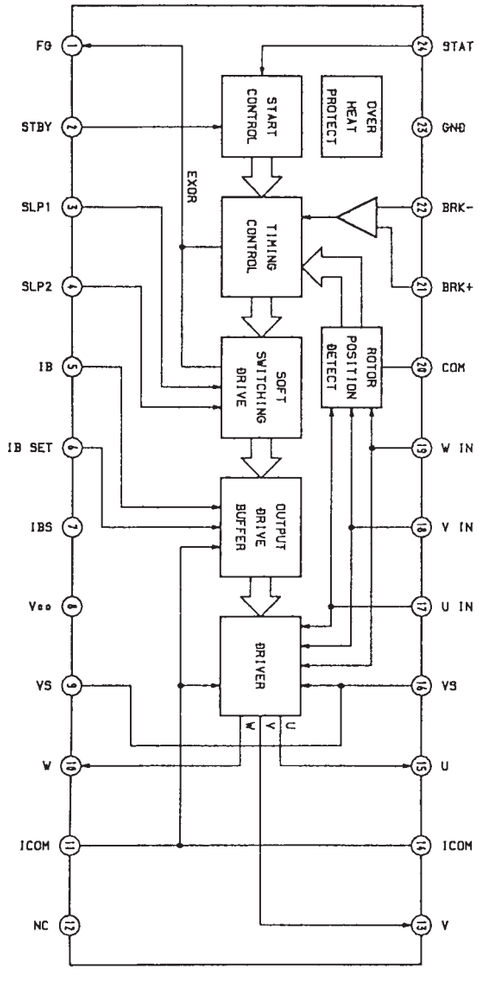
IC307 SN74HCT245ANS-E20



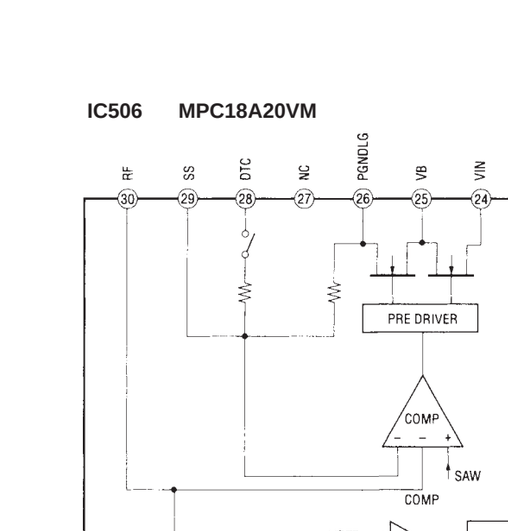
IC313 SN74LVC125APW-E20



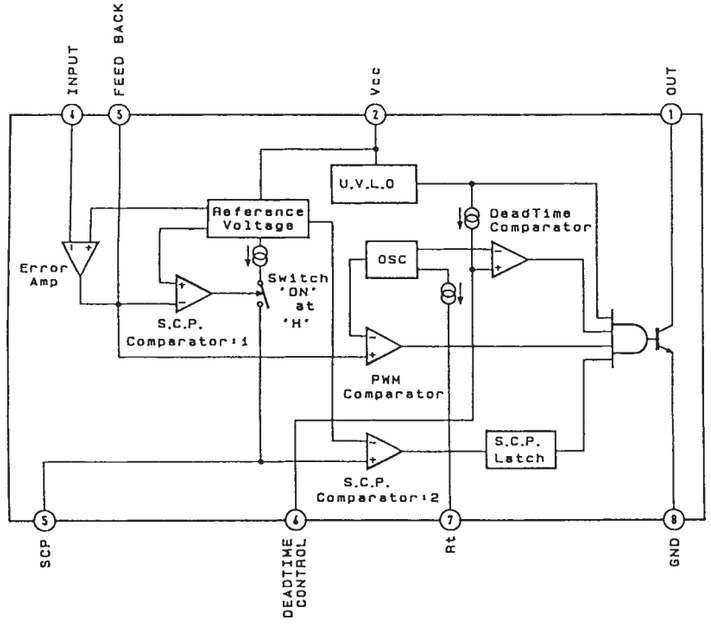
IC701 CXA8048N



IC802 RS5RJ29261



IC904 TL5001CD



6-17. IC PIN FUNCTION

• IC503 CXD2652AR (DIGITAL SERVO ENC/DEC, ATRAC)/MAIN BOARD

Pin No.	Pin Name	I/O	Description
1	MNT0	O	Traverse count signal output.
2	MNT1	O	Track jump detection output.
3	MNT2	—	Not used. (Open).
4	MNT3	—	Not used. (Open).
5	SWDT	I	Write data signal input from system control (IC801).
6	SCLK	I	Serial clock signal input from system control (IC801).
7	XLAT	I	Serial latch signal input from system control (IC801).
8	SRDT	O	Read data signal output to system control (IC801).
9	SENS	O	Internal status (SENSE) signal output to system control (IC801).
10	XRST	I	Reset signal input from system control (IC801). L: reset.
11	SQSY	O	Sub code Q sync (SCOR) signal output to system control (IC801). “L” is output every 13.3 mseconds. “H” is output most of time.
12	DQSY	O	Sub code Q sync (SCOR) of DIGITAL IN U-bit CD format signal output to system control (IC801). “L” is output every 13.3 mseconds. “H” is output most of time. (Not used).
13	WRPWR	I	Laser power switch signal input from system control.
14	NC	—	Not used. (Open).
15	TX	I	Write data send timing input from system control.
16	OSC1	O	Clock output (22.5 MHz).
17	OSC0	I	Clock input (22.5 MHz).
18	XTSL	—	Not used. (Fixed to “H”).
19	RVDD	—	Not used. (GND).
20	RVSS	—	GND.
21	DIN	I	Digital audio signal input terminal (for optical input).
22	DOUT	O	Digital audio signal output terminal (for optical input).
23	ADDT	I	Audio data signal input from A/D and D/A converter (IC303).
24	DADT	O	Monitor/decode audio data signal output to A/D and D/A converter (IC303).
25	ALRCK	O	L/R clock signal output to A/D and D/A converter (IC303).
26	ABCK	O	Bit clock signal output to A/D and D/A converter (IC303).
27	FS256	O	11.2896 MHz clock output (MCLK system).
28	DVDD	—	Digital power supply terminal (+2.8 V).
29 ~ 32	A00 ~ A03	O	Address signal output to RAM (IC509).
33	NC	—	Not used. (Open).
34 ~ 38	A04 ~ A08	O	Address signal output to RAM (IC509).
39	NC	—	Not used. (Open).
40	DVSS	—	GND.
41	XOE	O	Output enable control signal output to RAM (IC509).
42	XCAS	O	Column address strobe signal output to RAM (IC509).
43	A09	O	Address signal output to RAM (IC509).
44	XRAS	O	Load address strobe signal output to RAM (IC509).
45	XWE	O	Read/write control signal output to RAM (IC509).
46 ~ 49	D0 ~ D3	I	Data signal input from RAM (IC509).
50	MVCI	—	Not used. (GND).
51	ASYO	O	Playback EFM full swing output. L: Vss, H: VDD.
52	ASYI	I	Playback EFM asymmetry comparate voltage input.
53	AVDD	—	Analog power supply terminal (+2.8 V).
54	BIAS	I	Playback EFM asymmetry circuit constant current input.
55	RFI	I	Playback EFM RF signal input from RF amplifier (IC501).

Pin No.	Pin Name	I/O	Description
56	AVSS	—	GND.
57	PDO	—	Not used. (Open).
58	PCO	O	Phase comparison output from master clock PLL of the decoder PLL.
59	FILI	I	Filter input to master clock PLL of the decoder PLL.
60	FILO	O	Filter output from master clock PLL of the decoder PLL.
61	CLTV	I	VCO control voltage input from master clock PLL of the decoder PLL.
62	PEAK	I	Optical light amount signal - peak hold signal input from RF amplifier (IC501).
63	BOTM	I	Optical light amount signal - bottom hold signal input from RF amplifier (IC501).
64	ABCD	I	Optical light amount signal input from RF amplifier (IC501).
65	FE	I	Focus error signal input from RF amplifier (IC501).
66	AUX 1	I	Auxiliary signal input from RF amplifier (IC501).
67	VC	I	Center voltage input from RF amplifier (IC501).
68	ADIO	—	Not used. (Open).
69	AVDD	—	Analog power supply terminal (+2.8 V).
70	ADRT	—	Not used. (Connected to +2.8 V).
71	ADRB	—	Not used. (GND).
72	AVSS	—	GND.
73	SE	I	Sled error signal input from RF amplifier (IC501).
74	TE	I	Tracking error signal input from RF amplifier (IC501).
75	AUX 2	—	Not used. (Connected to +2.8 V).
76	DCHG	—	Not used. (Connected to +2.8 V).
77	APC	—	Not used. (Connected to +2.8 V).
78	ADFG	I	ADIP duplexed FM signal input (22.05 kHz ±1 kHz) input from RF amplifier (IC501). (Schmitt input).
79	FO CONT	O	Focus control output to RF amplifier (IC501).
80	XLRF	I	Latch signal input RF amplifier (IC501).
81	CKRF	O	RFCK clock (7.35 kHz) signal output.
82	DTRF	I	Serial data input from microprocessor (IC801).
83	APCREF	I	Input terminal for setting the laser power.
84	LDDR	—	Not used. (Open).
85	TRDR	O	Tracking servo drive signal output (–).
86	TFDR	O	Tracking servo drive signal output (+).
87	DVDD	—	Digital power supply terminal (+2.8 V).
88	FFDR	O	Focus servo drive signal output (–).
89	FRDR	O	Focus servo drive signal output (+).
90	FS 4	O	176.4 kHz clock signal output (MCLK system).
91	SRDR	O	Sled servo drive signal output (–).
92	SFDR	O	Sled servo drive signal output (+).
93	SPRD	O	Spindle servo drive signal output (–).
94	SPFD	O	Spindle servo drive signal output (+).
95	FGIN	I	FG input terminal from spindle motor driver (IC701).
96 ~ 98	TEST 1 ~ 3	—	Not used. (GND).
99	DVSS	—	GND.
100	EFMO	O	EFM signal output (for recording).

• **IC801 CXP801960M-644R (SYSTEM CONTROL)/MAIN BOARD**

Pin No.	Pin Name	I/O	Description
1	CLCS	O	Chip select output to real time clock (IC804).
2	XRST	O	Reset output. L: reset.
3	WRPWR	O	Laser power select signal output.
4	TX	O	Write data transmission timing output.
5	SENSE	I	Sense input.
6	LDON	O	"H": APC circuit ON, "L": APC circuit OFF.
7	XSHOCK	I	Track jump detection signal input from IC503.
8	NC	—	Not used. (Open).
9	INLS	I	Input from sled switch detecting internal circumference. L: internal circumference.
10	PROTECT	I	Disc write protect switch input. H: Protect.
11	DATA	O	Remote control data output.
12	HOLD	I	Input from HOLD switch of the machine. L: Hold.
13	WP	I	Wake-up signal input from key input.
14	OPEN	I	Input from top lid open/close detection switch of the machine. L: Close.
15	CLOCK	I	CLOCK SET switch input.
16	CLS DIO	I	Clock data input.
17	EVR DATA	O	Electronic volume control output.
18	CSST	O	Serial communication chip select output to system control (IC907).
19	LCD CD	O	LCD command data output.
20	CLSCK	O	Serial clock output to real time clock (IC804).
21	SDI2	I	Serial data input.
22 ~ 24	NC	—	Not used. (Open).
25	AVLS	I	Audio volume limit switch input. L: ON.
26	TEST	I	Test mode terminal. L: Test mode.
27	$\overline{\text{DCIN}}$	I	DC IN input detection. L: DC IN.
28	KANA SEL	I	Not used. (Connected GND).
29	XAM CN	O	"H" output when operating on external battery.
30	$\overline{\text{P CONT}}$	O	Power control output. L: ON.
31	$\overline{\text{BATT ON}}$	O	"H" output when operating on lithium battery.
32	REC LED	O	REC LED control output. L: ON.
33	MODE2	O	Control signal output to head drive (IC506).
34	MODE1	O	Control signal output to head drive (IC506).
35	RFSW	O	Power control output to RF amplifier (IC501).
36	$\overline{\text{LCD ON}}$	O	LCD ON/OFF control. L: ON.
37	MP	—	Microprocessor mode input. (Connected GND).
38	$\overline{\text{MRST}}$	I	Microprocessor reset.
39	VSS	—	GND.
40	XTAL	—	Terminal to which external system clock (12 MHz) crystal is connected.
41	EXTAL	—	Terminal to which external system clock (12 MHz) crystal is connected.
42	CS0	—	Serial chip select input. (Connected VDD).
43	SDI0	I	Serial communication input from system control (IC907).
44	SDO0	O	Serial communication output to LCD and system control (IC907).
45	SCK0	O	Serial clock output to LCD and system control (IC907).
46 ~ 48	NC	—	Not used. (GND).
49	KEYR	I	Remote control key input.
50	AVSS	—	GND terminal of A/D converter.

Pin No.	Pin Name	I/O	Description
51	AVREF	—	Reference voltage input of A/D converter.
52	AVDD	—	Power supply terminal of A/D converter.
53	AM3	I	External battery detection input.
54	TEMP	I	Thermal sensor (IC803) input.
55	KEY3	I	PLAY key/REC key input.
56	KEY2	—	Key input from the machine. (Connected to VDD).
57	KEY0	I	Key input from the machine.
58	KEY1	I	Key input from the machine.
59	UNREG MNT	I	Unregulated voltage monitor input.
60	LIMNT	I	Lithium battery voltage monitor input.
61	FGIN	I	FG input from spindle motor driver (IC701).
62	DBB1	I	Digital Mega-base select input. #1.
63	DBB2	I	Digital Mega-base select input. #2.
64	INTSW	I	INITIAL switch input.
65	PACK IN	I	MEDIA switch input.
66	NC	—	Not used. (Open).
67	NC	—	Not used. (Open).
68	$\overline{\text{MICDET}}$	I	MIC jack detection input.
69	XLAT	O	Latch output.
70	KEYON	O	L: During SLEEP mode. H: During operation.
71	ST1A	O	Stepping motor control output.
72	ST2A	O	Stepping motor control output.
73	—	—	Not used. (Open).
74	—	—	Not used. (Open).
75	DQSY	I	Sub code Q sync (SCOR) of DIGITAL IN U-bit CD format signal input from IC503.
76	TCOUNT	I	Traverse count signal input.
77	SDI1	I	Serial data input.
78	SDO1	O	Serial data output.
79	SCK1	O	Serial clock output.
80	SQSY	I	Sub-Q/ADIP sync input.
81	BEEP	O	Beep sound output control. H: Beep sound is output.
82	—	—	Not used. (Open).
83	REFLECT	I	CD/MO identification switch.
84	TEX	—	Not used. (Connected GND).
85	XT	—	Not used. (Open).
86	VSS	—	GND.
87	VDD	—	Microprocessor power supply.
88	NC	—	Not used. (Connected VDD).
89	CS	O	Chip select output to D/A converter.
90	$\overline{\text{PD}}$	O	D/A converter power down signal output during recording.
91	ST1B	O	Stepping motor control signal output.
92	ST2B	O	Stepping motor control signal output.
93	AMUTE	O	Analog mute control. H: Mute.
94	XLCDRST	O	LCD reset signal output.
95	CS EVR	O	Chip select signal output to audio gain control.
96	CSNV	O	Chip select signal output to NV-RAM.
97	SCK2	O	Serial clock output.
98	NC	—	Not used. (GND).
99	SDO2	O	Serial data output.
100	LCD CS	O	Chip select signal output to LCD.

• **IC907 CXP84632-18Q (SYSTEM CONTROL) / RADIAL BOARD**

Pin No.	Pin Name	I/O	Description
1	DEEMP	O	Emphasis ON/OFF switching signal output. 1: OFF.
2	MOTOR CONT	O	Motor (M931) speed control signal output.
3	MSTOP	O	Motor (M931) stop signal output. 0: Motor stop.
4	TXD	—	Not used. (Open).
5	RXD	—	Not used. (Open).
6	CHARGE LED	O	Control signal output to charge LED. 1: LED ON.
7	PCONT	O	Power supply control output. 1: Power supply ON.
8	LCD ON	O	Power supply control output to LCD MODULE (LCD901). 1: LCD ON.
9	BLON	O	Back-light ON/OFF switching signal output. 1: Back-light ON.
10	OPT EN	O	Optical light output enable signal output.
11	OPT	O	OPT1/OPT2 select signal output.
12	LCD STB	O	Strobe signal output to LCD driver.
13	LCD SCK	O	Serial clock output to LCD driver.
14 ~ 21	DB0-DB7	O	Data output to LCD driver.
22	AC IN	I	AC IN detection. 0: Active pull up.
23	XLION	I	Detection input from LION switch (S951). 0: Li battery.
24	XRELEASE	I	Detection input from RELEASE switch (S953). 0: RELEASE switch ON.
25	XLOCK	I	Detection input from XLOCK switch (S655).
26	PLAY KEY	I	Playback key input.
27	REC KEY	I	Record key input.
28	CLOCK KEY	I	CLOCK SET key input.
29	POWER KEY	I	POWER key input.
30	RST	I	System reset signal input.
31	EXTAL	—	Terminal to which external system clock (10 MHz) crystal is connected.
32	XTAL	—	Terminal to which external system clock (10 MHz) crystal is connected.
33	VSS	—	GND.
34	TX	—	Not used. (Open).
35	TEX	—	Not used. (Open).
36	AVSS	—	GND terminal of A/D converter.
37	AVREF	—	Reference voltage input of A/D converter. (Connected VDD).
38	KEY0	I	A/D key input 0.
39	KEY1	I	A/D key input 1.
40	KEY2	I	A/D key input 2.
41	KEY3	I	A/D key input 3.
42	KEY4	I	A/D key input 4.
43	LI+MNT	I	Lithium ion battery + voltage monitor input.
44	AC	I	AC voltage value detection input (Sampling detection).
45	NC	—	Not used. (Open).
46	BUF EN	O	3 V → 5 V output switch signal output.
47	SCS0	I	Serial communication chip select signal input from system control (IC801).
48	SCK0	I	Serial clock input from system control (IC801).
49	SDI0	O	Serial communication output to system control (IC801).
50	SDO0	I	Serial communication input from system control (IC801).

Pin No.	Pin Name	I/O	Description
51 ~ 53	NC	—	Not used. (Open).
54	TIMER1	I	TIMER switch (S613) signal input.
55	TIMER2	I	TIMER switch (S613) signal input.
56	RMC	I	Remote control signal input.
57	X TEST	I	Test mode setting terminal.
58	NC	—	Not used. (Open).
59	NC	—	Not used. (Open).
60	XPDAD	O	A/D converter ON/OFF signal output.
61	XINIT	I	Machine's initial position detection signal input from XINT switch (S650).
62	NC	—	Not used. (Open).
63	PANEL DOWN	I	LCD panel closed detected signal input.
64	NC	—	Not used. (Open).
65	ESCK	O	Serial clock output of EVR communication.
66	ECS	O	Chip select signal output of EVR communication.
67	EDATA	O	Data signal output of EVR communication.
68	LICHG	O	Lithium ion rechargeable battery select output.
69	LION	O	Machine's lithium ion rechargeable battery select output.
70	STLION	O	Station's lithium ion rechargeable battery select output.
71	PMUTE	O	Mute signal output at the time when main power is turned on.
72	VDD	—	Power supply terminal.
73	NC	—	Not used. (Connected to VDD).
74	LINE OPT1	I	Input select signal input.
75	LINE OPT2	I	Input select signal input.
76	SYNCREC	I	Sync record ON/OFF signal input.
77	DEST	I	Destination setting terminal. 0: Japan model.
78	DIF0	O	ADA data setting 0.
79	DIF1	O	ADA data setting 1.
80	XRESET	O	Reset signal output to A/D, D/A converters.

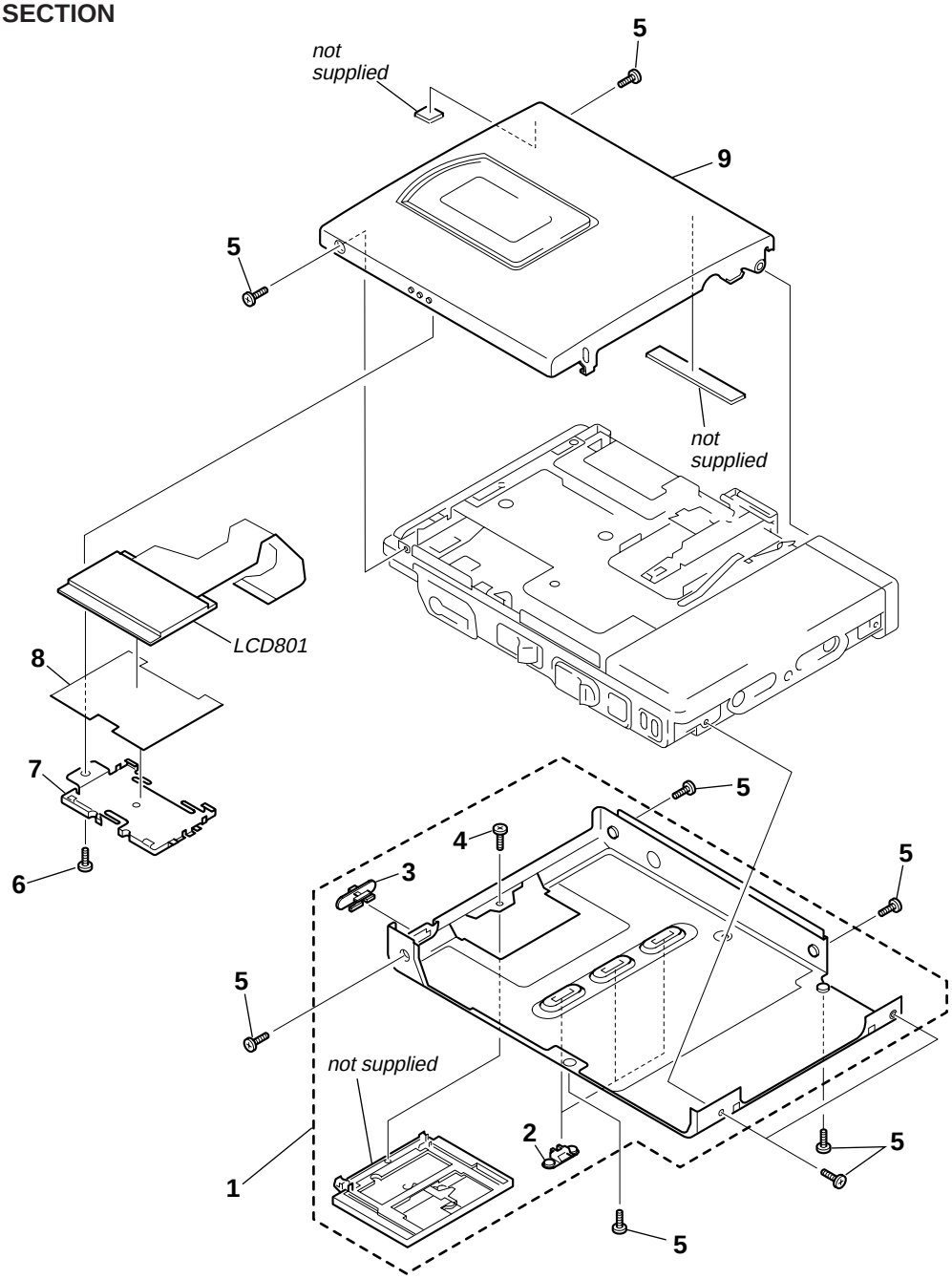
SECTION 7
EXPLODED VIEWS

NOTE:

- -XX, -X mean standardized parts, so they may have some differences from the original one.
- Items marked "*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- The mechanical parts with no reference number in the exploded views are not supplied.
- Hardware (# mark) list and accessories and packing materials are given in the last of this parts list.

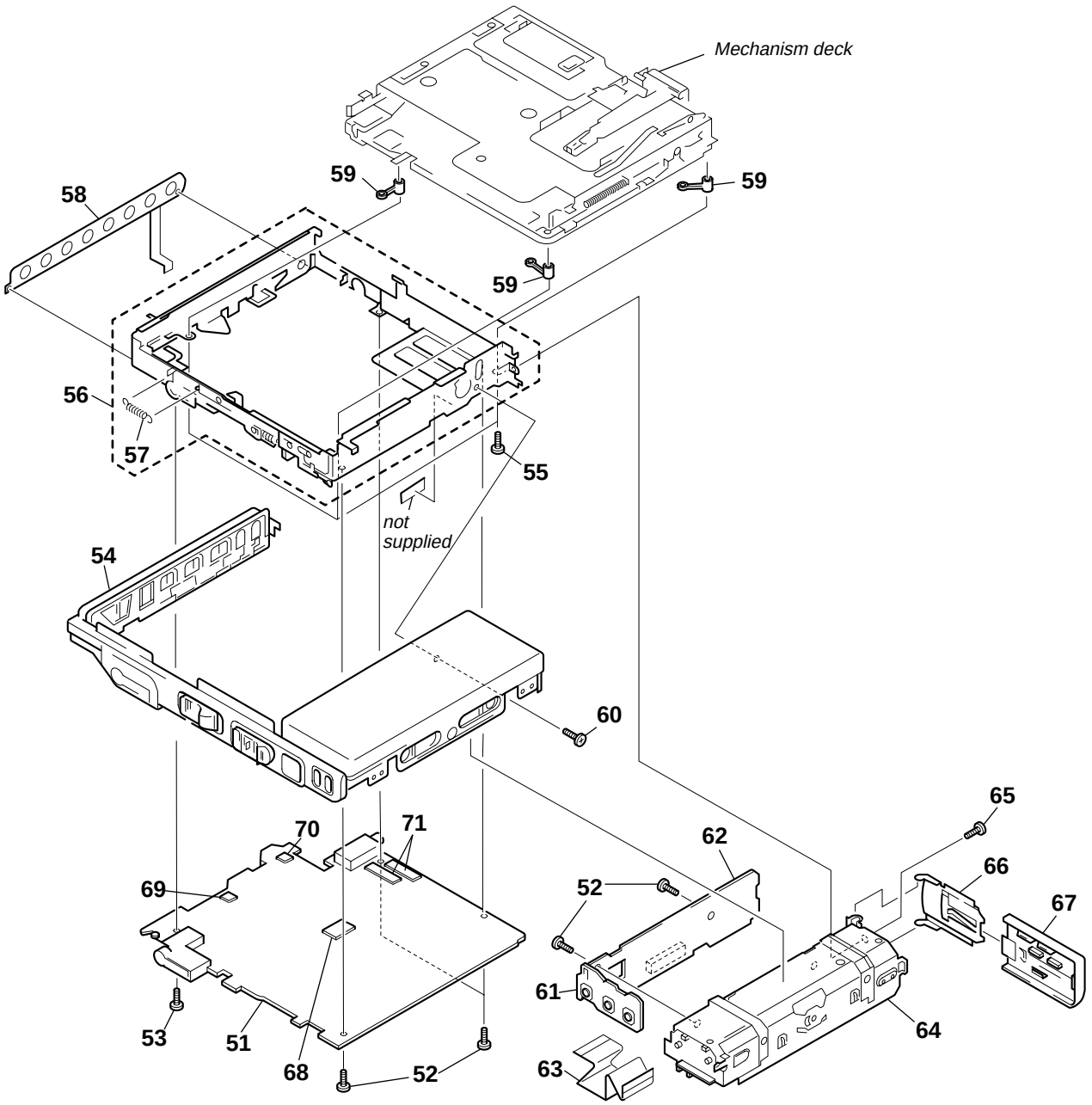
The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety. Replace only with part number specified.

7-1. PANEL SECTION



Ref. No.	Part No.	Description	Remarks
1	X-4949-157-1	PANEL ASSY, BOTTOM	
2	3-938-805-01	KNOB (DOLBY)	
3	3-919-630-01	KNOB (AVLS)	
4	3-348-998-31	SCREW (M1.4X2.5), TAPPING, PAN	
5	4-963-883-61	SCREW (M1.4), PRECISION PAN	
6	3-366-890-11	SCREW (M1.4)	
7	4-983-979-01	HOLDER (LCD)	
8	4-985-621-01	SPACER (LCD)	
9	X-4949-156-1	PANEL ASSY, UPPER	
LCD801	1-801-903-11	LCD	

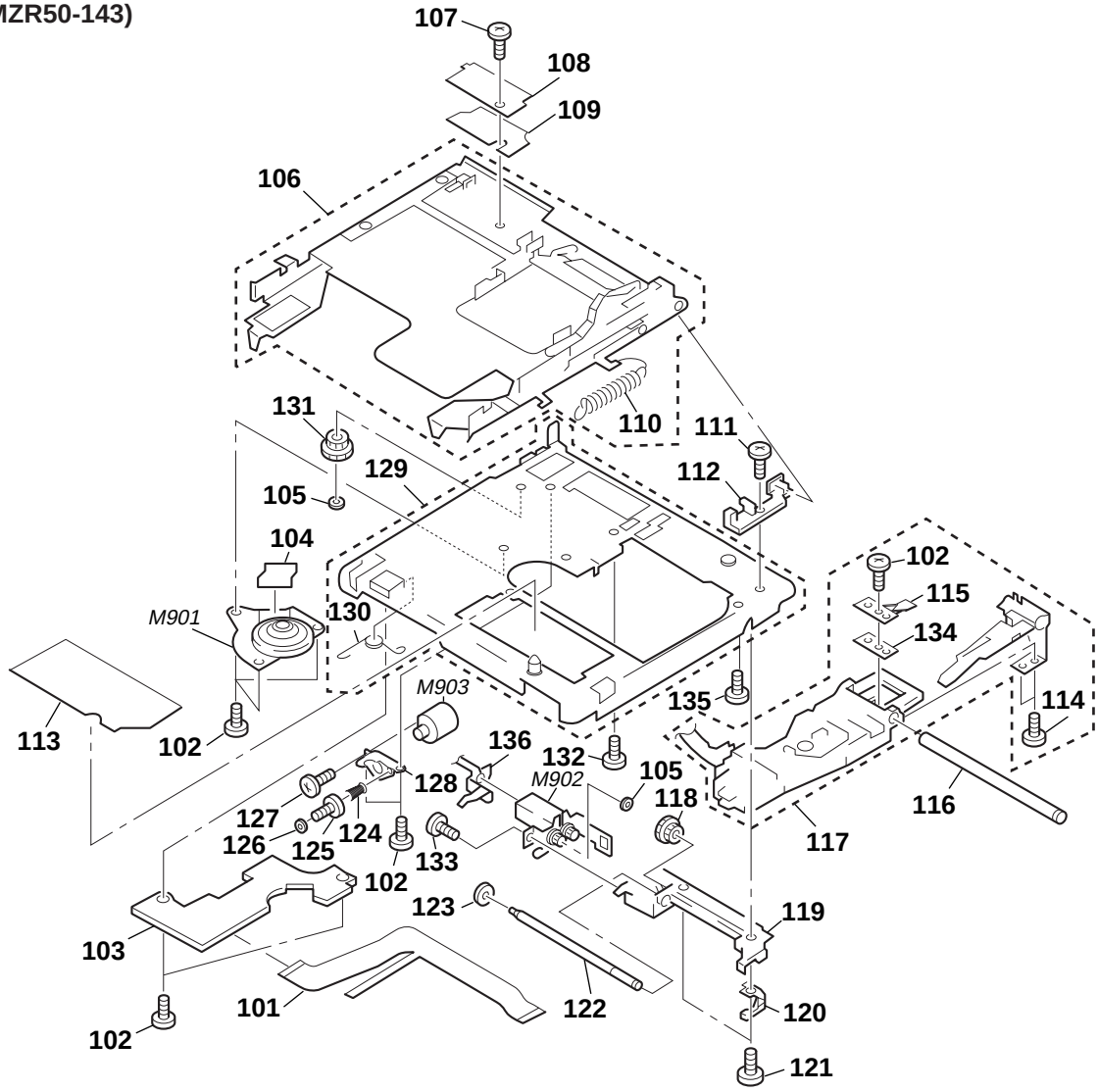
7-2. MAIN BOARD SECTION



Ref. No.	Part No.	Description	Remarks
51	A-3293-769-A	MAIN BOARD ASSY	
52	3-335-797-91	SCREW (M1.4), TOOTHED LOCK	
53	4-995-436-01	SCREW (HP), STEP	
54	X-4949-155-1	BELT ASSY, ORNAMENTAL	
55	4-995-437-01	SCREW (DAMPER)	
56	X-4949-154-1	CHASSIS (MAIN ST) ASSY	
57	4-995-402-01	SPRING (LOCK), TENSION	
58	1-475-368-11	SW UNIT	
59	4-995-435-01	DAMPER (R50)	
60	3-349-825-51	SCREW	
* 61	1-667-219-11	SW BOARD	

Ref. No.	Part No.	Description	Remarks
62	A-3293-770-A	POWER BOARD ASSY	
63	1-782-708-11	WIRE (FLAT TYPE) (20 CORE)	
64	X-4949-116-1	CASE ASSY, BATTERY	
65	4-963-883-61	SCREW (M1.4), PRECISION PAN	
66	4-995-432-01	HINGE, BATTERY	
67	4-995-722-01	LID, BATTERY CASE	
68	4-998-405-01	SHEET (CLV)	
69	4-998-407-01	HIMERON TAPE (DAMPER)	
70	4-998-844-01	SHEET (SW)	
71	4-998-406-01	SHEET (LCD)	

7-3. MD MECHANISM SECTION (MT-MZR50-143)

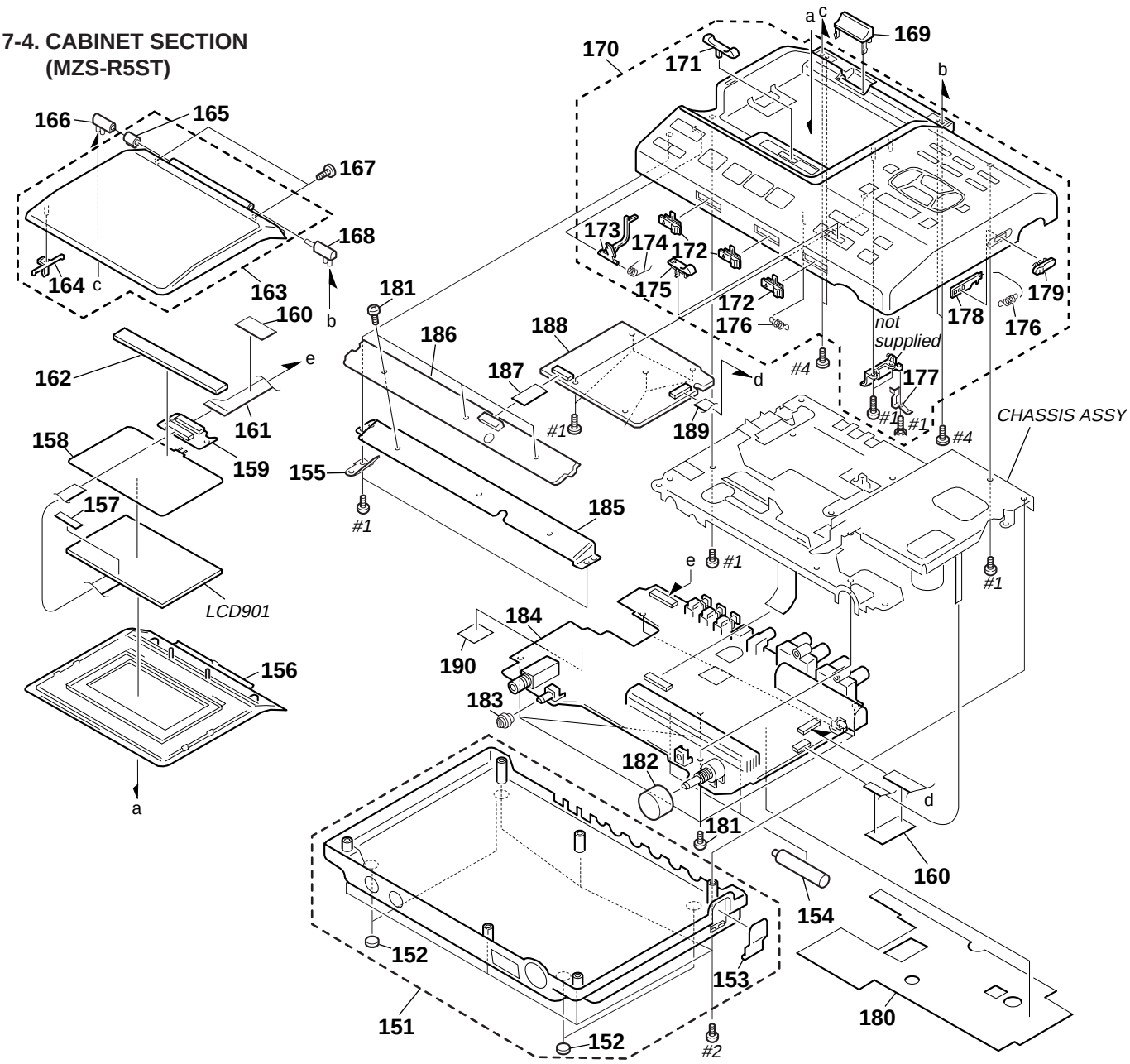


Ref. No.	Part No.	Description	Remarks
101	1-667-210-11	MD FLEXIBLE BOARD	
102	4-963-883-01	SCREW (M1.4), PRECISION PAN	
103	A-3293-756-A	CLV BOARD, COMPLETE	
104	1-667-690-11	CLV FLEXIBLE BOARD	
105	3-338-645-31	WASHER (0.8-2.5)	
106	X-4949-129-1	HOLDER ASSY	
107	3-349-825-41	SCREW	
108	A-3293-755-A	REC BOARD, COMPLETE	
109	4-995-575-01	SHEET, INSULATING	
110	4-995-573-01	SPRING, TENSION	
111	3-704-246-13	SCREW (P1.4X2.0)	
* 112	4-995-568-01	GUIDE, HOLDER	
113	4-995-572-01	SHEET, BLIND	
114	4-955-841-01	SCREW	
115	4-995-570-01	SPRING, RACK	
116	4-995-567-01	SHAFT, MAIN	
⚠117	X-4949-256-1	OPTICAL PICK-UP ASSY (KMS-280A/JZN)	
118	4-995-578-01	GEAR (SC)	
119	X-4949-131-1	BRACKET (S) ASSY	
120	4-995-571-01	SPRING, THRUST	

Ref. No.	Part No.	Description	Remarks
121	4-963-883-41	SCREW (M1.4), PRECISION PAN	
122	4-995-580-01	SCREW, LEAD	
123	4-995-586-01	GEAR (SD)	
124	4-972-546-01	SPRING (WORM GEAR),COMPRESSION	
125	4-963-901-01	GEAR, WORM	
126	3-315-384-11	WASHER, STOPPER	
127	4-964-564-01	SCREW (M1.2X1.6)	
128	X-4949-127-1	CHASSIS ASSY, GEAR	
129	X-4949-126-1	CHASSIS ASSY	
130	4-995-585-01	SPRING (LIMITTER), TORSION	
131	4-963-898-11	GEAR (WORM WHEEL)	
132	3-704-197-31	SCREW (M1.4X3.0), LOCKING	
133	3-015-033-01	SCREW (DIA. 1.4X4), PRECISION	
134	4-997-228-11	SPACER (RACK SPRING)	
135	4-997-172-01	SCREW (M1.4X3)	
136	1-667-211-11	MOTOR FLEXIBLE BOARD	
M901	1-763-011-11	MOTOR	
M902	A-3311-972-A	MOTOR BLOCK ASSY, SLED	
M903	A-3320-037-A	STEPPER BLOCK ASSY	

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

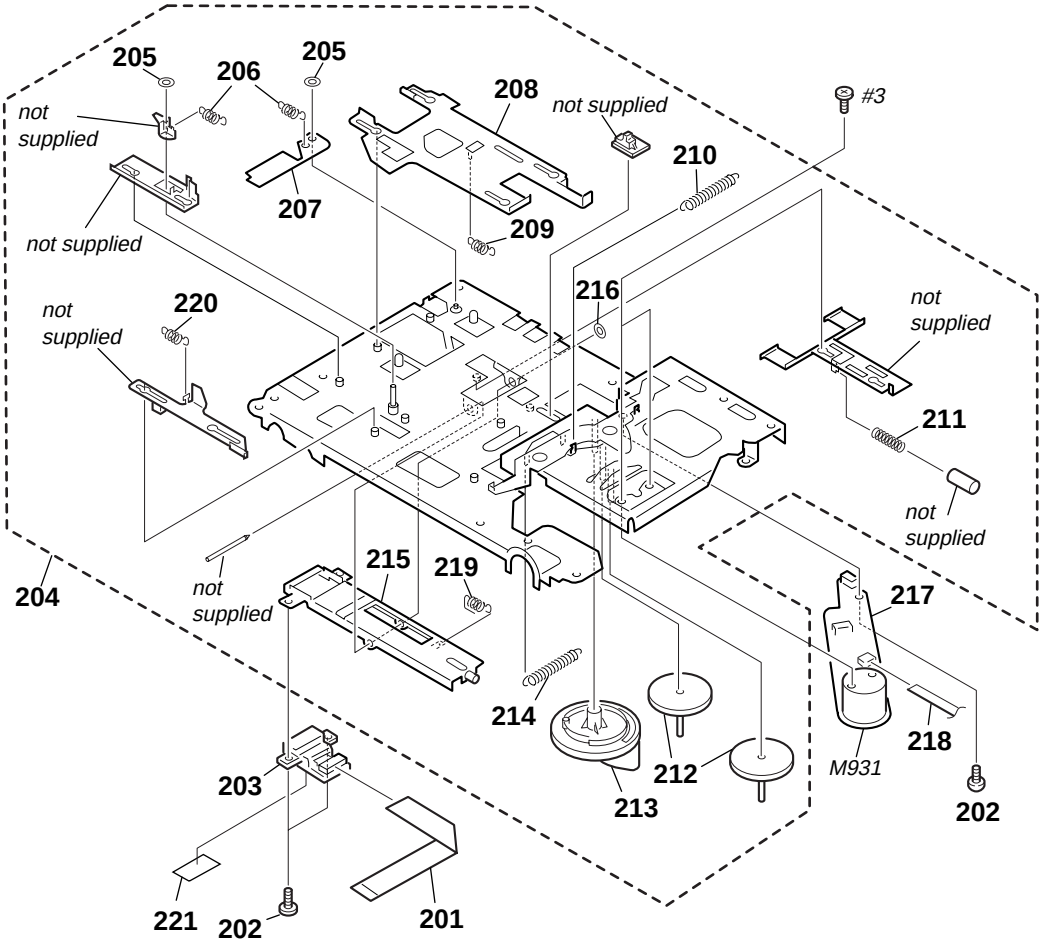
7-4. CABINET SECTION (MZS-R5ST)



Ref. No.	Part No.	Description	Remarks
151	X-4948-958-1	CABINET (LOWER) ASSY	
152	3-329-013-01	FOOT, RUBBER	
153	4-994-423-01	LID, BATTERY CASE	
* 154	1-528-797-11	BATTERY, NI-CD	
155	4-996-753-01	TERMINAL, GROUND	
156	X-4949-300-1	PANEL (LCD) ASSY, INNER	
157	4-994-432-01	SHEET (LCD) (B), ADHESIVE	
158	1-801-897-11	ELEMENT, EL LUMINOUS	
* 159	1-667-220-11	LCD/EL BOARD	
160	3-831-441-99	CUSHION (B), CABINET	
161	1-667-281-11	LCD/EL FLEXIBLE BOARD	
162	4-998-442-01	CUSHION	
163	X-4948-959-1	PANEL (LCD) BLOCK ASSY, OUTER	
164	4-994-435-01	KNOB (LCD OPEN)	
165	X-4948-642-1	FULCRUM ASSY, 1200 LCD LID	
166	4-994-436-01	COVER (L), HINGE	
167	3-334-565-51	SCREW (B1.7), TAPPING	
168	4-994-437-01	COVER (R), HINGE	
169	4-994-438-01	COVER (FLEXIBLE)	
170	X-4948-953-1	CABINET (UPPER) ASSY	

Ref. No.	Part No.	Description	Remarks
171	4-994-416-01	KNOB (RELEASE)	
172	4-983-880-11	KNOB (D/A)	
173	4-994-417-01	LEVER (LCD)	
174	4-994-418-01	SPRING, TORSION	
175	4-983-881-01	KNOB (REC)	
176	3-539-226-00	SPRING, TENSION	
177	4-994-421-01	CONTACT (GROUND)	
178	4-994-415-01	LEVER (LID LOCK)	
179	4-983-290-31	KNOB (OPEN)	
180	4-996-867-01	PAPER, SHIELD	
181	4-987-714-01	SCREW	
182	X-4949-239-1	KNOB (REC VOL) ASSY	
183	4-973-220-21	KNOB (VOL)	
184	A-3306-961-A	RADIAL BOARD, COMPLETE	
* 185	4-994-419-01	BRACKET (SW PC BOARD)	
* 186	1-667-234-11	STATION SW2 BOARD	
187	1-782-719-11	WIRE (FLAT TYPE) (14 CORE)	
* 188	1-667-233-11	STATION SW1 BOARD	
189	1-782-851-11	WIRE (FLAT TYPE) (16 CORE)	
190	3-831-441-99	CUSHION (B), CABINET	
LCD901	1-801-898-11	LCD MODULE	

7-5. SHASSIS SECTION
(MZS-R5ST)



Ref. No.	Part No.	Description	Remarks
201	1-782-852-11	WIRE (FLAT TYPE) (22 CORE)	
202	4-987-714-01	SCREW	
* 203	1-667-231-11	STATION CN BOARD	
204	X-4948-960-1	CHASSIS ASSY	
205	3-341-752-11	WASHER, POLYETHYLENE	
206	3-305-902-00	SPRING, TENSION	
207	4-983-862-01	SHUTTER (ST)	
208	4-983-861-11	LOCK SLIDER	
209	4-998-235-01	SPRING, TENSION	
210	3-440-152-03	SPRING, TENSION	
211	3-655-233-01	SPRING	

Ref. No.	Part No.	Description	Remarks
212	4-983-867-01	GEAR (STEP)	
213	4-983-868-11	GEAR (CAM)	
214	3-542-481-00	SPRING, TENSION	
215	X-4947-409-1	ARM ASSY, CONNECTOR	
216	4-988-064-01	WASHER (ARM)	
217	1-667-232-11	MECHA SW BOARD	
218	1-782-850-11	WIRE (FLAT TYPE) (6 CORE)	
219	4-987-869-01	SPRING, TENSION	
220	4-954-160-01	SPRING, TENSION	
* 221	3-344-749-01	RETAINER (B)	
M931	A-3304-761-A	MOTOR ASSY	

CLV | LCD/EL | MAIN

SECTION 8
ELECTRICAL PARTS LIST

NOTE:

When indicating parts by reference number, please include the board name.

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety. Replace only with part number specified.

- Due to standardization, replacements in the parts list may be different from the parts specified in the diagrams or the components used on the set.
- -XX, -X mean standardized parts, so they may have some difference from the original one.
- Items marked "*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- CAPACITORS:
  uF: µF
- RESISTORS
  All resistors are in ohms.
  METAL: metal-film resistor
  METAL OXIDE: Metal Oxide-film resistor
  F: nonflammable
- COILS
  uH: µH
- SEMICONDUCTORS
  In each case, u: µ, for example:
  uA...: µA... , uPA... , µPA... ,
  uPB... , µPB... , uPC... , µPC... ,
  uPD..., µPD...

Ref. No.	Part No.	Description			Remarks
	A-3293-756-A	CLV BOARD			
		**********			
		< CAPACITOR >			
C701	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C702	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C703	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C704	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C705	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C706	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C707	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C709	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C710	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C711	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
		< CONNECTOR >			
CN701	1-573-927-11	CONNECTOR, FFC/FPC (ZIF) 18P			
CN702	1-573-915-11	CONNECTOR, FFC/FPC (ZIF) 6P			
		< IC >			
IC701	8-759-335-44	IC CXA8048N			
		< TRANSISTOR >			
Q703	8-729-427-83	TRANSISTOR XP6501			
		< RESISTOR >			
R701	1-218-871-11	RES, CHIP	10K (1608)		
R702	1-218-871-11	RES, CHIP	10K (1608)		
R703	1-216-815-11	METAL CHIP	330	5%	1/16W
R704	1-217-671-11	METAL CHIP	1	5%	1/10W
R705	1-217-671-11	METAL CHIP	1	5%	1/10W
R706	1-216-833-11	METAL CHIP	10K	5%	1/16W
R711	1-216-864-11	METAL CHIP	0	5%	1/16W
		< SWITCH >			
S701	1-762-805-41	SWITCH, PUSH (1 KEY)(MEDIA)			
S702	1-762-835-11	SWITCH, PUSH (1 KEY)(PROTECT)			
S703	1-762-805-41	SWITCH, PUSH (1 KEY)(REFLECT)			
S704	1-771-092-21	SWITCH, PUSH (1 KEY)(INITIAL)			
S705	1-572-467-41	SWITCH, PUSH (1 KEY)(INLIMIT)			

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Ref. No.	Part No.	Description			Remarks
*	1-667-220-11	LCD/EL BOARD			
		**********			
		< CONNECTOR >			
CN604	1-569-532-11	HOUSING, CONNECTOR 30P			
CN605	1-569-532-11	HOUSING, CONNECTOR 30P			

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	A-3293-769-A	MAIN BOARD			
		**********			
		< CAPACITOR >			
C101	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C103	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C104	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C105	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C106	1-110-569-11	TANTAL. CHIP	47uF	20%	6.3V
C107	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C109	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C110	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C117	1-119-660-11	TANTAL. CHIP	4.7uF	20%	6.3V
C118	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C120	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C124	1-165-128-11	CERAMIC CHIP	0.22uF		16V
C125	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C161	1-162-963-11	CERAMIC CHIP	680PF	10%	50V
C168	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C201	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C203	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C204	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C205	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C206	1-110-569-11	TANTAL. CHIP	47uF	20%	6.3V
C207	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C209	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C210	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C217	1-119-660-11	TANTAL. CHIP	4.7uF	20%	6.3V
C218	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C220	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C224	1-165-128-11	CERAMIC CHIP	0.22uF		16V
C225	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C261	1-162-963-11	CERAMIC CHIP	680PF	10%	50V
C268	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C292	1-119-660-11	TANTAL. CHIP	4.7uF	20%	6.3V
C293	1-104-912-11	TANTAL. CHIP	3.3uF	20%	6.3V
C294	1-104-847-11	TANTAL. CHIP	22uF	20%	4V
C295	1-119-660-11	TANTAL. CHIP	4.7uF	20%	6.3V
C296	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V

Ref. No.	Part No.	Description			Remarks
C301	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C303	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C304	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C305	1-110-569-11	TANTAL. CHIP	47uF	20%	6.3V
C306	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C307	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C310	1-164-361-11	CERAMIC CHIP	0.047uF		16V
C315	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C318	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C320	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C321	1-110-569-11	TANTAL. CHIP	47uF	20%	6.3V
C322	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C327	1-104-852-11	TANTAL. CHIP	22uF	20%	6.3V
C338	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C345	1-119-661-11	TANTAL. CHIP	33uF	20%	6.3V
C346	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C359	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C365	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C366	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C368	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C369	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C399	1-107-816-11	TANTAL. CHIP	0.68uF	20%	10V
C501	1-115-169-11	TANTALUM	10uF	20%	6.3V
C504	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C505	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C506	1-162-965-11	CERAMIC CHIP	0.0015uF	10%	50V
C507	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C508	1-162-969-11	CERAMIC CHIP	0.0068uF	10%	25V
C509	1-115-467-11	CERAMIC CHIP	0.22uF	10%	10V
C510	1-162-968-11	CERAMIC CHIP	0.0047uF	10%	50V
C511	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C512	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C513	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C515	1-119-661-11	TANTAL. CHIP	33uF	20%	6.3V
C517	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C518	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C519	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C521	1-164-677-11	CERAMIC CHIP	0.033uF	10%	16V
C522	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C524	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C525	1-104-852-11	TANTAL. CHIP	22uF	20%	6.3V
C526	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C529	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C530	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C531	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C532	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C533	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C534	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C536	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C537	1-104-908-11	TANTAL. CHIP	47uF	20%	4V
C538	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C541	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C542	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C544	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C545	1-104-852-11	TANTAL. CHIP	22uF	20%	10V
C546	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C547	1-104-912-11	TANTAL. CHIP	3.3uF	20%	16V
C548	1-104-912-11	TANTAL. CHIP	3.3uF	20%	16V
C549	1-113-682-11	TANTAL. CHIP	33uF	20%	10V
C550	1-113-682-11	TANTAL. CHIP	33uF	20%	10V
C551	1-104-912-11	TANTAL. CHIP	3.3uF	20%	16V
C552	1-104-912-11	TANTAL. CHIP	3.3uF	20%	16V
C553	1-113-682-11	TANTAL. CHIP	33uF	20%	10V
C554	1-104-913-11	TANTAL. CHIP	10uF	20%	16V
C555	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C559	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C560	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C561	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C562	1-104-852-11	TANTAL. CHIP	22uF	20%	10V
C563	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C564	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C565	1-135-180-21	TANTALUM CHIP	3.3uF	20%	6.3V
C566	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C567	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C569	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C570	1-119-661-11	TANTAL. CHIP	33uF	20%	6.3V
C571	1-119-661-11	TANTAL. CHIP	33uF	20%	6.3V
C574	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C575	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C576	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C714	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C716	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C812	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C813	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C814	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C815	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C816	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C818	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C819	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C820	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C821	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C822	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C824	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C825	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C826	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C827	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C829	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C830	1-110-569-11	TANTAL. CHIP	47uF	20%	6.3V
C831	1-104-852-11	TANTAL. CHIP	22uF	20%	10V
C833	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C834	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C851	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C861	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C862	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C865	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C899	1-251-641-11	ELEMENT, STORAGE			
		< CONNECTOR >			
CN501	1-573-931-11	CONNECTOR, FFC/FPC (ZIF) 22P			
CN502	1-573-362-11	CONNECTOR, FFC/FPC 22P			
CN801	1-573-360-21	CONNECTOR, FFC/FPC 20P			
CN803	1-573-918-11	CONNECTOR, FFC/FPC (ZIF) 9P			
CN804	1-573-365-21	CONNECTOR, FFC/FPC 25P			
		< DIODE >			
D302	8-719-066-17	DIODE FTZ6.8E-T148			
D303	8-719-066-17	DIODE FTZ6.8E-T148			
D304	8-719-941-23	DIODE DA204U			
D501	8-719-421-27	DIODE MA728			
D502	8-719-421-27	DIODE MA728			

MAIN

Ref. No.	Part No.	Description			Remarks
D803	8-719-066-44	DIODE CL-270HR-C-TS (REC)			
D804	8-719-045-67	DIODE RB731U-T108			
D806	8-719-421-27	DIODE MA728			
D807	8-719-421-27	DIODE MA728			
D808	8-719-047-73	DIODE HRU0302A-TR			
		< FERRITE BEAD >			
FB135	1-216-864-11	METAL CHIP	0	5%	1/16W
FB235	1-216-864-11	METAL CHIP	0	5%	1/16W
FB301	1-414-385-11	INDUCTOR	0UH		
FB302	1-216-864-11	METAL CHIP	0	5%	1/16W
FB303	1-216-864-11	METAL CHIP	0	5%	1/16W
FB304	1-216-864-11	METAL CHIP	0	5%	1/16W
FB305	1-216-864-11	METAL CHIP	0	5%	1/16W
FB350	1-216-864-11	METAL CHIP	0	5%	1/16W
FB501	1-216-864-11	METAL CHIP	0	5%	1/16W
FB502	1-216-864-11	METAL CHIP	0	5%	1/16W
FB503	1-216-864-11	METAL CHIP	0	5%	1/16W
FB504	1-216-864-11	METAL CHIP	0	5%	1/16W
FB505	1-216-864-11	METAL CHIP	0	5%	1/16W
		< IC >			
IC301	8-759-482-09	IC RN5RZ25BA-TL			
IC302	8-759-252-90	IC TLV2362IPW-ELM1500			
IC303	8-759-439-74	IC AK4515-VQ			
IC305	8-759-481-66	IC DS1801E-014TE2			
IC306	8-759-487-19	IC PST9322UL			
IC501	8-752-085-60	IC CXA2523AR-T4			
IC503	8-752-384-47	IC CXD2652AR			
IC505	8-759-460-34	IC MPC17A36VMEL			
IC506	8-759-329-43	IC MPC18A20VM			
IC509	8-759-334-38	IC MSM51V4400-70TS-K			
IC509	8-759-349-44	IC MB81V4400C-60PFTN			
IC509	8-759-334-38	IC MSM51V4400-70TS-K			
IC510	8-759-487-20	IC PST9330UL			
IC511	8-759-196-97	IC TC7SH32FU-TE85R			
IC512	8-759-271-86	IC TC7SH04FU			
IC702	8-759-482-07	IC MPC17A28SVMEL			
IC801	8-782-893-71	IC			
IC802	8-759-343-90	IC RS5RJ29261			
IC803	8-759-332-25	IC XC31PNS01AMR			
IC804	8-759-343-88	IC DS1302Z			
IC805	8-759-497-20	IC LA4800V-S-TLM			
IC807	8-759-457-68	IC AK93C45AV-L			
IC811	8-759-465-98	IC BU9728AKV-E2			
		< JACK >			
J301	1-779-881-21	JACK (MIC)			
J302	1-778-179-11	JACK (🎧 /REMOTE)			
		< COIL >			
L303	1-414-398-11	INDUCTOR	10uH		
L304	1-414-398-11	INDUCTOR	10uH		
L501	1-414-398-11	INDUCTOR	10uH		
L502	1-414-398-11	INDUCTOR	10uH		
L504	1-414-410-21	INDUCTOR	10uH		
L505	1-412-034-11	INDUCTOR CHIP	330uH		
L506	1-414-402-11	INDUCTOR	47uH		
L507	1-414-402-11	INDUCTOR	47uH		
L508	1-414-402-11	INDUCTOR	47uH		
L509	1-414-402-11	INDUCTOR	47uH		

Ref. No.	Part No.	Description			Remarks
L510	1-414-410-21	INDUCTOR	10uH		
L511	1-414-402-11	INDUCTOR	47uH		
L513	1-414-398-11	INDUCTOR	10uH		
L514	1-412-034-11	INDUCTOR CHIP	330uH		
L801	1-414-402-11	INDUCTOR	47uH		
		< TRANSISTOR >			
Q101	8-729-013-37	TRANSISTOR	2SC4213-AB-TE85L		
Q201	8-729-013-37	TRANSISTOR	2SC4213-AB-TE85L		
Q301	8-729-028-91	TRANSISTOR	DTA144EUA-T106		
Q311	8-729-930-00	TRANSISTOR	UMD2		
Q313	8-729-929-80	TRANSISTOR	UMB2		
Q314	8-729-929-80	TRANSISTOR	UMB2		
Q502	8-729-422-39	TRANSISTOR	XN4404		
Q503	8-729-930-13	TRANSISTOR	UMH2		
Q504	8-729-019-25	TRANSISTOR	2SK1467-TD		
Q505	8-729-930-00	TRANSISTOR	UMD2		
Q801	8-729-930-00	TRANSISTOR	UMD2		
Q806	8-729-031-34	TRANSISTOR	2SK2034		
Q809	8-729-031-34	TRANSISTOR	2SK2034		
Q810	8-729-905-35	TRANSISTOR	2SC4081-R		
		< RESISTOR >			
R101	1-218-867-11	RES, CHIP	6.8K (1608)		
R103	1-218-867-11	RES, CHIP	6.8K (1608)		
R105	1-216-837-11	METAL CHIP	22K	5%	1/16W
R107	1-218-883-11	RES, CHIP	33K (1608)		
R108	1-218-843-11	RES, CHIP	680 (1608)		
R119	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R136	1-218-863-11	RES, CHIP	4.7K (1608)		
R137	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R160	1-216-857-11	METAL CHIP	1M	5%	1/16W
R161	1-218-847-11	RES, CHIP	1.0K (1608)		
R201	1-218-867-11	RES, CHIP	6.8K (1608)		
R203	1-218-867-11	RES, CHIP	6.8K (1608)		
R205	1-216-837-11	METAL CHIP	22K	5%	1/16W
R207	1-218-883-11	RES, CHIP	33K (1608)		
R208	1-218-843-11	RES, CHIP	680 (1608)		
R219	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R236	1-218-863-11	RES, CHIP	4.7K (1608)		
R237	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R260	1-216-857-11	METAL CHIP	1M	5%	1/16W
R261	1-218-847-11	RES, CHIP	1.0K (1608)		
R306	1-216-797-11	METAL CHIP	10	5%	1/16W
R364	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R365	1-216-809-11	METAL CHIP	100	5%	1/16W
R374	1-216-845-11	METAL CHIP	100K	5%	1/16W
R380	1-216-864-11	METAL CHIP	0	5%	1/16W
R381	1-216-809-11	METAL CHIP	100	5%	1/16W
R382	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R383	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R501	1-216-835-11	METAL CHIP	15K	5%	1/16W
R502	1-216-835-11	METAL CHIP	15K	5%	1/16W
R503	1-216-831-11	METAL CHIP	6.8K	5%	1/16W
R504	1-216-859-11	RES, CHIP	1.5M (1608)		
R505	1-218-446-11	METAL CHIP	1	5%	1/16W
R506	1-216-811-11	METAL CHIP	150	5%	1/16W
R507	1-216-833-11	METAL CHIP	10K	5%	1/16W

Ref. No.	Part No.	Description			Remarks
R508	1-216-817-11	METAL CHIP	470	5%	1/16W
R509	1-216-853-11	METAL CHIP	470K	5%	1/16W
R510	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R511	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R512	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R513	1-216-843-11	METAL CHIP	68K	5%	1/16W
R514	1-216-864-11	METAL CHIP	0	5%	1/16W
R515	1-216-864-11	METAL CHIP	0	5%	1/16W
R516	1-216-821-11	METAL CHIP	1K	5%	1/16W
R517	1-216-803-11	METAL CHIP	33	5%	1/16W
R518	1-216-864-11	METAL CHIP	0	5%	1/16W
R520	1-216-841-11	METAL CHIP	47K	5%	1/16W
R524	1-216-833-11	METAL CHIP	10K	5%	1/16W
R525	1-216-845-11	METAL CHIP	100K	5%	1/16W
R526	1-216-853-11	METAL CHIP	470K	5%	1/16W
R528	1-216-821-11	METAL CHIP	1K	5%	1/16W
R529	1-216-821-11	METAL CHIP	1K	5%	1/16W
R530	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R531	1-216-845-11	METAL CHIP	100K	5%	1/16W
R536	1-218-891-11	RES, CHIP	68K (1608)		
R537	1-218-899-11	RES, CHIP	150K (1608)		
R538	1-218-895-11	RES, CHIP	100K (1608)		
R539	1-216-833-11	METAL CHIP	10K	5%	1/16W
R540	1-216-857-11	METAL CHIP	1M	5%	1/16W
R541	1-216-843-11	METAL CHIP	68K	5%	1/16W
R542	1-218-903-11	RES, CHIP	220K (1608)		
R543	1-218-887-11	RES, CHIP	47K (1608)		
R545	1-216-845-11	METAL CHIP	100K	5%	1/16W
R546	1-216-841-11	METAL CHIP	47K	5%	1/16W
R549	1-216-845-11	METAL CHIP	100K	5%	1/16W
R554	1-216-821-11	METAL CHIP	1K	5%	1/16W
R555	1-216-864-11	METAL CHIP	0	5%	1/16W
R559	1-216-811-11	METAL CHIP	150	5%	1/16W
R562	1-218-887-11	RES, CHIP	47K (1608)		
R563	1-216-833-11	METAL CHIP	10K	5%	1/16W
R564	1-216-843-11	METAL CHIP	68K	5%	1/16W
R565	1-216-845-11	METAL CHIP	100K	5%	1/16W
R566	1-216-841-11	METAL CHIP	47K	5%	1/16W
R571	1-216-864-11	METAL CHIP	0	5%	1/16W
R572	1-216-864-11	METAL CHIP	0	5%	1/16W
R576	1-216-864-11	METAL CHIP	0	5%	1/16W
R581	1-216-841-11	METAL CHIP	47K	5%	1/16W
R582	1-216-841-11	METAL CHIP	47K	5%	1/16W
R583	1-216-864-11	METAL CHIP	0	5%	1/16W
R584	1-216-864-11	METAL CHIP	0	5%	1/16W
R585	1-216-857-11	METAL CHIP	1M	5%	1/16W
R710	1-216-819-11	METAL CHIP	680	5%	1/16W
R802	1-216-851-11	METAL CHIP	330K	5%	1/16W
R803	1-216-857-11	METAL CHIP	1M	5%	1/16W
R806	1-216-857-11	METAL CHIP	1M	5%	1/16W
R816	1-216-851-11	METAL CHIP	330K	5%	1/16W
R817	1-216-851-11	METAL CHIP	330K	5%	1/16W
R818	1-216-857-11	METAL CHIP	1M	5%	1/16W
R820	1-218-887-11	RES, CHIP	47K (1608)		
R821	1-218-887-11	RES, CHIP	47K (1608)		
R822	1-218-887-11	RES, CHIP	47K (1608)		
R824	1-218-887-11	RES, CHIP	47K (1608)		
R825	1-216-851-11	METAL CHIP	330K	5%	1/16W
R826	1-216-864-11	METAL CHIP	0	5%	1/16W
R828	1-218-911-11	RES, CHIP	470K (1608)		

Ref. No.	Part No.	Description			Remarks
R829	1-218-899-11	RES, CHIP	150K (1608)		
R830	1-216-851-11	METAL CHIP	330K	5%	1/16W
R831	1-216-857-11	METAL CHIP	1M	5%	1/16W
R833	1-216-857-11	METAL CHIP	1M	5%	1/16W
R834	1-216-857-11	METAL CHIP	1M	5%	1/16W
R836	1-218-871-11	RES, CHIP	10K (1608)		
R837	1-216-851-11	METAL CHIP	330K	5%	1/16W
R838	1-218-887-11	RES, CHIP	47K (1608)		
R842	1-216-864-11	METAL CHIP	0	5%	1/16W
R853	1-216-809-11	METAL CHIP	100	5%	1/16W
R856	1-216-821-11	METAL CHIP	1K	5%	1/16W
R857	1-216-833-11	METAL CHIP	10K	5%	1/16W
R861	1-216-857-11	METAL CHIP	1M	5%	1/16W
R865	1-216-809-11	METAL CHIP	100	5%	1/16W
R867	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R868	1-216-845-11	METAL CHIP	100K	5%	1/16W
R873	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R877	1-216-845-11	METAL CHIP	100K	5%	1/16W
R878	1-216-833-11	METAL CHIP	10K	5%	1/16W
R881	1-216-853-11	METAL CHIP	470K	5%	1/16W
R882	1-216-845-11	METAL CHIP	100K	5%	1/16W
R883	1-216-845-11	METAL CHIP	100K	5%	1/16W
R884	1-216-845-11	METAL CHIP	100K	5%	1/16W
R885	1-216-864-11	METAL CHIP	0	5%	1/16W
R886	1-218-867-11	RES, CHIP	6.8K (1608)		
R887	1-218-871-11	RES, CHIP	10K (1608)		
R888	1-218-875-11	RES, CHIP	15K (1608)		
R889	1-218-883-11	RES, CHIP	33K (1608)		
R890	1-218-887-11	RES, CHIP	47K (1608)		
R891	1-218-899-11	RES, CHIP	150K (1608)		
R893	1-216-821-11	METAL CHIP	1K	5%	1/16W
R894	1-216-821-11	METAL CHIP	1K	5%	1/16W
R899	1-216-857-11	METAL CHIP	1M	5%	1/16W
		< CONPOSITION CIRCUIT BLOCK >			
RB301	1-233-971-11	RES, NETWORK (CHIP TYPE) 47K			
RB802	1-233-976-11	RES, NETWORK (CHIP TYPE) 330K			
RB803	1-233-965-11	RES, NETWORK (CHIP TYPE) 4.7K			
RB804	1-233-979-11	RES, NETWORK (CHIP TYPE) 1M			
RB805	1-233-976-11	RES, NETWORK (CHIP TYPE) 330K			
RB807	1-233-979-11	RES, NETWORK (CHIP TYPE) 1M			
RB808	1-233-973-11	RES, NETWORK (CHIP TYPE) 100K			
		< SWITCH >			
S301	1-762-078-11	SWITCH, SLIDE (MIC SENS)			
S808	1-771-091-21	SWITCH, PUSH (1 KEY) (REC)			
S809	1-572-921-11	SWITCH, KEY BOARD (CLOCK SET)			
S810	1-762-079-11	SWITCH, SLIDE (DIGITAL MEGA BASS)			
S811	1-762-078-11	SWITCH, SLIDE (AVLS)			
S817	1-762-805-41	SWITCH, PUSH (1 KEY) (OPEN1)			
S818	1-762-078-11	SWITCH, SLIDE (HOLD)			
S823	1-572-467-41	SWITCH, PUSH (1 KEY) (OPEN2)			

MAIN **MECHA SW** **POWER** **RADIAL**

Ref. No.	Part No.	Description			Remarks
		< VIBRATOR >			
X501	1-767-722-21	VIBRATOR, CRYSTAL 22.5MHz			
X801	1-760-174-31	VIBRATOR, CERAMIC 12MHz			
X802	1-579-886-21	VIBRATOR, CRYSTAL 32KHz			
**********					
*	1-667-232-11	MECHA SW BOARD			
		**********			
		< CONNECTOR >			
CN656	1-778-367-11	CONNECTOR HOSING 6P			
		< SWITCH >			
S655	1-692-163-11	MICRO SWITCH (X LOCK)			
S656	1-771-218-11	MICRO SWITCH (X INT)			
**********					
	A-3293-770-A	POWER BOARD			
		**********			
		< CAPACITOR >			
C801	1-117-720-11	CERAMIC CHIP	4.7uF		10V
C802	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C803	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C804	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C805	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C807	1-162-965-11	CERAMIC CHIP	0.0015uF	10%	50V
C809	1-115-169-11	TANTALUM	10uF	20%	6.3V
C810	1-117-720-11	CERAMIC CHIP	4.7uF		10V
C832	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C837	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C840	1-126-923-11	ELECT	220uF	20%	10V
C841	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C842	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C843	1-117-919-11	TANTAL. CHIP	10uF	20%	6.3V
C860	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
		< CONNECTOR >			
CN805	1-573-929-11	CONNECTOR, FFC/FPC (ZIF) 20P			
		< DIODE >			
D801	8-719-988-07	DIODE RB400D			
D810	8-719-988-62	DIODE 1SS355			
		< IC >			
IC806	8-759-331-73	IC MB3800PNF			
IC808	8-729-039-08	IC TRANSISTOR SI6946DQ-T1			
		< COIL >			
L512	1-416-436-11	COIL, CHOKE	68uH		
L802	1-411-803-21	COIL, CHOKE	33uH		
L804	1-414-410-21	INDUCTOR	10uH		
L805	1-414-410-21	INDUCTOR	10uH		

Ref. No.	Part No.	Description			Remarks
		< TRANSISTOR >			
Q803	8-729-807-52	TRANSISTOR 2SD1623-T			
Q804	8-729-822-62	TRANSISTOR 2SB1302-T			
Q805	8-729-905-35	TRANSISTOR 2SC4081-R			
Q901	8-729-029-14	TRANSISTOR DTC144EUA-T106			
		< RESISTOR >			
R801	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R808	1-216-817-11	METAL CHIP	470	5%	1/16W
R809	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R810	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R811	1-216-821-11	METAL CHIP	1K	5%	1/16W
R812	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R814	1-218-883-11	RES, CHIP	33K (1608)		
R815	1-218-863-11	RES, CHIP	4.7K (1608)		
R875	1-216-801-11	METAL CHIP	22	5%	1/16W
R879	1-216-864-11	METAL CHIP	0	5%	1/16W
R880	1-216-837-11	METAL CHIP	22K	5%	1/16W
R901	1-216-823-11	METAL CHIP	1.5K	5%	1/16W
		< VARIABLE RESISTOR >			
RV801	1-223-994-21	RES, CARBON ADJ VAR 4.7K			
**********					
	A-3306-961-A	RADIAL BOARD,COMPLETE			
		**********			
	3-561-902-00	CLOTH, RETAINING, CASSETTE			
	4-984-015-01	TERMINAL, BATTERY			
	4-985-124-01	SPRING (POP UP ST), COIL			
	4-994-426-01	CASE, BU BATTERY			
	4-994-427-01	SPRING, BATTERY COIL			
	4-994-428-01	CASE, BATTERY			
	4-994-454-01	TERMINAL (BU)			
	4-996-642-01	SHEET, BLIND			
	7-685-104-19	SCREW +P 2X6 TYPE2 NON-SLIT			
		< CAPACITOR >			
C103	1-124-584-00	ELECT	100uF	20%	10V
C104	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C105	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C107	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C108	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C109	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C111	1-124-257-00	ELECT	2.2uF	20%	50V
C112	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C114	1-124-589-11	ELECT	47uF	20%	16V
C115	1-126-157-11	ELECT	10uF	20%	16V
C116	1-164-505-11	CERAMIC CHIP	2.2uF		16V
C117	1-126-935-11	ELECT	470uF	20%	6.3V
C118	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C119	1-126-157-11	ELECT	10uF	20%	16V
C124	1-126-157-11	ELECT	10uF	20%	10V
C125	1-126-157-11	ELECT	10uF	20%	10V
C127	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C128	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C129	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C130	1-162-927-11	CERAMIC CHIP	100PF	5%	50V

Ref. No.	Part No.	Description			Remarks
C131	1-126-157-11	ELECT	10uF	20%	16V
C132	1-164-505-11	CERAMIC CHIP	2.2uF		16V
C133	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C134	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C135	1-162-921-11	CERAMIC CHIP	33PF	5%	50V
C136	1-162-921-11	CERAMIC CHIP	33PF	5%	50V
C141	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C180	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C181	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C182	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C203	1-124-584-00	ELECT	100uF	20%	10V
C204	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C205	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C207	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C208	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C209	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C211	1-124-257-00	ELECT	2.2uF	20%	50V
C214	1-124-589-11	ELECT	47uF	20%	16V
C215	1-126-157-11	ELECT	10uF	20%	16V
C216	1-164-505-11	CERAMIC CHIP	2.2uF		16V
C217	1-126-935-11	ELECT	470uF	20%	6.3V
C218	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C219	1-126-157-11	ELECT	10uF	20%	16V
C224	1-126-157-11	ELECT	10uF	20%	10V
C225	1-126-157-11	ELECT	10uF	20%	10V
C227	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C228	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C229	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C230	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C231	1-126-157-11	ELECT	10uF	20%	16V
C232	1-164-505-11	CERAMIC CHIP	2.2uF		16V
C233	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C234	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C235	1-162-921-11	CERAMIC CHIP	33PF	5%	50V
C236	1-162-921-11	CERAMIC CHIP	33PF	5%	50V
C237	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C238	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C239	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C240	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C241	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C280	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C281	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C282	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C301	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C302	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C304	1-126-157-11	ELECT	10uF	20%	16V
C305	1-124-779-00	ELECT CHIP	10uF	20%	16V
C306	1-124-779-00	ELECT CHIP	10uF	20%	16V
C307	1-126-157-11	ELECT	10uF	20%	16V
C309	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C310	1-126-935-11	ELECT	470uF	20%	6.3V
C311	1-124-257-00	ELECT	2.2uF	20%	50V
C312	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C313	1-126-157-11	ELECT	10uF	20%	16V
C314	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C315	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C316	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C319	1-126-157-11	ELECT	10uF	20%	16V
C320	1-164-505-11	CERAMIC CHIP	2.2uF		16V
C321	1-165-112-11	CERAMIC CHIP	0.33uF		16V
C322	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C323	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C324	1-124-257-00	ELECT	2.2uF	20%	50V
C330	1-124-229-00	ELECT	33uF	20%	10V
C333	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C334	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C390	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C901	1-124-234-00	ELECT	22uF	20%	16V
C902	1-124-234-00	ELECT	22uF	20%	16V
C903	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C904	1-165-112-11	CERAMIC CHIP	0.33uF		16V
C905	1-126-160-11	ELECT	1uF	20%	50V
C906	1-126-160-11	ELECT	1uF	20%	50V
C908	1-127-531-11	CAPACITOR	33uF	20%	10V
C909	1-124-257-00	ELECT	2.2uF	20%	50V
C910	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C911	1-124-584-00	ELECT	100uF	20%	10V
C912	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C913	1-162-957-11	CERAMIC CHIP	220PF	5%	50V
C914	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C915	1-126-157-11	ELECT	10uF	20%	16V
C916	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C917	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C918	1-162-957-11	CERAMIC CHIP	220PF	5%	50V
C920	1-162-968-11	CERAMIC CHIP	0.0047uF	10%	50V
C921	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C922	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C923	1-126-942-61	ELECT	1000uF	20%	25V
C924	1-127-509-00	CAPACITOR	3.3uF	20%	25V
C925	1-164-299-11	CERAMIC CHIP	0.22uF	10%	25V
C926	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C929	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C930	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C931	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C932	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C933	1-126-157-11	ELECT	10uF	20%	16V
C934	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C935	1-126-157-11	ELECT	10uF	20%	16V
C936	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C937	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C938	1-124-234-00	ELECT	22uF	20%	16V
C939	1-126-154-11	ELECT	47uF	20%	6.3V
C941	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C942	1-126-157-11	ELECT	10uF	20%	16V
C943	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C944	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C945	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C946	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C947	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C948	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C949	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C950	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C951	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C952	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C953	1-124-239-00	ELECT	6.9uF	20%	10V
C954	1-128-057-11	ELECT	330uF	20%	6.3V

RADIAL

Ref. No.	Part No.	Description			Remarks
C955	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C958	1-126-157-11	ELECT	10uF	20%	16V
C959	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C960	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C961	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C963	1-124-584-00	ELECT	100uF	20%	10V
C964	1-124-584-00	ELECT	100uF	20%	10V
C965	1-126-205-11	ELECT CHIP	47uF	20%	6.3V
C966	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
		< CONNECTOR >			
* CN951	1-691-798-11	HOUSING, CONNECTOR 22P			
* CN952	1-784-005-21	HOUSING,CONNECTOR (FPC/FFC) 16P			
CN953	1-778-365-11	HOUSING, CONNECTOR (FPC/FFC) 6P			
* CN954	1-784-006-21	CONNECTOR, FPC (ZIF) 30P			
		< DIODE >			
D301	8-719-941-86	DIODE DAN202U			
D310	8-719-421-27	DIODE MA728			
D320	8-719-914-42	DIODE DA204K			
D901	8-719-066-16	DIODE RB491D-T146			
D902	8-719-048-98	DIODE RB160L-40TE25			
D903	8-719-048-98	DIODE RB160L-40TE25			
D904	8-719-976-06	DIODE BR5334S (CHARGE)			
D905	8-719-048-98	DIODE RB160L-40TE25			
D906	8-719-938-75	DIODE SB05-05CP			
D907	8-719-938-75	DIODE SB05-05CP			
D908	8-719-047-73	DIODE HRU0302A-TR			
D909	8-719-048-98	DIODE RB160L-40TE25			
D910	8-719-991-75	DIODE RB425D			
		< EL LUMINOUS ELEMENT >			
EL901	1-431-541-11	TRANSFORMER, EL OSCILLATION			
		< IC >			
IC101	8-759-357-68	IC NJM2115M-TE2			
IC130	8-759-358-47	IC NJM2115V (TE2)			
IC131	8-759-358-47	IC NJM2115V (TE2)			
IC201	8-759-357-68	IC NJM2115M-TE2			
IC230	8-759-358-47	IC NJM2115V (TE2)			
IC231	8-759-358-47	IC NJM2115V (TE2)			
IC301	8-759-471-38	IC AK4520A-VF-E2			
IC302	8-759-357-68	IC NJM2115M-TE2			
IC304	8-759-481-66	IC DS1801E-014TE2			
IC305	8-759-369-74	IC NJM4556AM-TE2			
IC306	8-759-462-30	IC TK11225BMCL			
IC307	8-759-269-65	IC SN74HCT245ANS-E20			
IC308	8-749-921-11	IC GP1F32R (DIGITAL IN (OPT1))			
IC309	8-749-921-11	IC GP1F32R (DIGITAL IN (OPT2))			
IC310	8-749-921-12	IC GP1F32T (DIGITAL OUT (OPTICAL)			
IC311	8-759-926-18	IC SN74HC157ANS			
IC313	8-759-481-73	IC SN74LVC125APW-E20			
IC314	8-759-460-32	IC XC62FP2902PR			
IC315	8-759-357-68	IC NJM2115M-TE2			
IC316	8-759-327-80	IC S-80745SN-D9-T1			
IC317	8-759-369-74	IC NJM4556AM-TE2			
IC330	8-759-358-47	IC NJM2115V (TE2)			
IC901	8-729-039-07	IC TRANSISTOR SI6943DQ-T1			
IC902	8-759-482-08	IC XC62EP4201MR			
IC904	8-759-521-35	IC TL5001CD			

Ref. No.	Part No.	Description	Remarks
IC905	8-759-521-35	IC TL5001CD	
IC906	8-759-486-73	IC XC62FP3302PR	
IC907	8-752-893-86	IC CXP84632-018Q	
IC908	8-759-343-90	IC RS5RJ29261	
IC909	8-719-066-43	IC DIODE GP1U28Y	
IC910	8-759-327-80	IC S-80745SN-D9-T1	
		< JACK >	
J301	1-568-267-21	JACK (ACTIVE SP OUT)	
J302	1-750-735-11	JACK (LARGE TYPE) (HEADPHONES)	
J303	1-778-355-11	JACK, PIN (LINE IN (ANALOG))	
J304	1-778-355-11	JACK, PIN (LINE OUT (ANALOG))	
J901	1-778-380-11	JACK,DC (POLARITY UNIFIED TYPE)	(DC IN 9V)
		< COIL >	
L301	1-414-398-11	INDUCTOR 10uH	
L302	1-414-398-11	INDUCTOR 10uH	
L303	1-414-398-11	INDUCTOR 10uH	
L901	1-416-416-11	COIL, CHOKE 33uH	
L902	1-416-416-11	COIL, CHOKE 33uH	
L903	1-410-626-11	COIL, CHOKE 47uH	
L904	1-416-415-11	COIL, CHOKE 15uH	
L905	1-414-398-11	INDUCTOR 10uH	
L906	1-414-402-11	INDUCTOR 47uH	
L907	1-414-398-11	INDUCTOR 10uH	
		< LINE FILTER >	
⚠ LF902	1-239-581-21	FILTER, EMI	
		< TRANSISTOR >	
Q101	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q102	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q103	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q104	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q201	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q202	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q203	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q204	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q301	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q302	8-729-904-60	TRANSISTOR DTB113ZK	
Q303	8-729-904-60	TRANSISTOR DTB113ZK	
Q304	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q901	8-729-042-81	TRANSISTOR FZT788BTC	
Q902	8-729-927-74	TRANSISTOR UMG2	
Q903	8-729-230-60	TRANSISTOR 2SA1586-YG	
Q904	8-729-907-00	TRANSISTOR DTC114EU	
Q905	8-729-904-60	TRANSISTOR DTB113ZK	
Q906	8-729-907-00	TRANSISTOR DTC114EU	
Q907	8-729-805-25	TRANSISTOR 2SB1121	
Q908	8-729-120-28	TRANSISTOR 2SC1623-L5L6	
Q909	8-729-907-00	TRANSISTOR DTC114EU	
Q910	8-729-805-25	TRANSISTOR 2SB1121	
Q911	8-729-930-04	TRANSISTOR UMD3	
Q912	8-729-904-60	TRANSISTOR DTB113ZK	
Q913	8-729-019-14	TRANSISTOR 2SC3739-T1B13B14	

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

Ref. No.	Part No.	Description			Remarks
Q914	8-729-930-04	TRANSISTOR UMD3			
Q915	8-729-930-04	TRANSISTOR UMD3			
Q916	8-729-907-00	TRANSISTOR DTC114EU			
Q917	8-729-019-14	TRANSISTOR 2SC3739-T1B13B14			
Q918	8-729-927-74	TRANSISTOR UMG2			
Q919	8-729-927-74	TRANSISTOR UMG2			
Q920	8-729-029-14	TRANSISTOR DTC144EUA-T106			
Q921	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L			
Q924	8-729-015-60	TRANSISTOR 2SJ316			
		< RESISTOR >			
R102	1-218-887-11	RES, CHIP	47K (1608)		
R103	1-218-863-11	RES, CHIP	4.7K (1608)		
R104	1-218-863-11	RES, CHIP	4.7K (1608)		
R105	1-218-863-11	RES, CHIP	4.7K (1608)		
R106	1-218-863-11	RES, CHIP	4.7K (1608)		
R108	1-218-863-11	RES, CHIP	4.7K (1608)		
R109	1-218-863-11	RES, CHIP	4.7K (1608)		
R110	1-216-817-11	METAL CHIP	470	5%	1/16W
R111	1-216-817-11	METAL CHIP	470	5%	1/16W
R112	1-218-879-11	RES, CHIP	22K (1608)		
R113	1-218-871-11	RES, CHIP	10K (1608)		
R114	1-218-855-11	RES, CHIP	2.2K (1608)		
R115	1-218-879-11	RES, CHIP	22K (1608)		
R116	1-216-821-11	METAL CHIP	1K	5%	1/16W
R117	1-218-891-11	RES, CHIP	68K (1608)		
R119	1-218-887-11	RES, CHIP	47K (1608)		
R120	1-218-891-11	RES, CHIP	68K (1608)		
R121	1-216-005-00	METAL CHIP	15	5%	1/10W
R122	1-216-821-11	METAL CHIP	1K	5%	1/16W
R123	1-216-817-11	METAL CHIP	470	5%	1/16W
R126	1-216-817-11	METAL CHIP	470	5%	1/16W
R127	1-216-821-11	METAL CHIP	1K	5%	1/16W
R128	1-216-845-11	METAL CHIP	100K	5%	1/16W
R130	1-218-863-11	RES, CHIP	4.7K (1608)		
R131	1-218-879-11	RES, CHIP	22K (1608)		
R133	1-216-158-00	RES, CHIP	22 (3216)		
R134	1-216-857-11	METAL CHIP	1M	5%	1/16W
R135	1-216-821-11	METAL CHIP	1K	5%	1/16W
R136	1-218-871-11	RES, CHIP	10K (1608)		
R137	1-218-871-11	RES, CHIP	10K (1608)		
R138	1-218-871-11	RES, CHIP	10K (1608)		
R139	1-218-871-11	RES, CHIP	10K (1608)		
R140	1-218-871-11	RES, CHIP	10K (1608)		
R141	1-218-871-11	RES, CHIP	10K (1608)		
R142	1-218-827-11	RES, CHIP	150 (1608)		
R143	1-218-871-11	RES, CHIP	10K (1608)		
R144	1-218-871-11	RES, CHIP	10K (1608)		
R145	1-218-871-11	RES, CHIP	10K (1608)		
R146	1-218-827-11	RES, CHIP	150 (1608)		
R147	1-218-871-11	RES, CHIP	10K (1608)		
R148	1-218-895-11	RES, CHIP	100K (1608)		
R149	1-216-845-11	METAL CHIP	100K	5%	1/16W
R151	1-218-867-11	RES, CHIP	6.8K (1608)		
R152	1-218-855-11	RES, CHIP	2.2K (1608)		
R202	1-218-887-11	RES, CHIP	47K (1608)		
R203	1-218-863-11	RES, CHIP	4.7K (1608)		
R204	1-218-863-11	RES, CHIP	4.7K (1608)		
R205	1-218-863-11	RES, CHIP	4.7K (1608)		
R206	1-218-863-11	RES, CHIP	4.7K (1608)		
R208	1-218-863-11	RES, CHIP	4.7K (1608)		

Ref. No.	Part No.	Description			Remarks
R209	1-218-863-11	RES, CHIP	4.7K (1608)		
R210	1-216-817-11	METAL CHIP	470	5%	1/16W
R211	1-216-817-11	METAL CHIP	470	5%	1/16W
R212	1-218-879-11	RES, CHIP	22K (1608)		
R213	1-218-871-11	RES, CHIP	10K (1608)		
R214	1-218-855-11	RES, CHIP	2.2K (1608)		
R215	1-218-879-11	RES, CHIP	22K (1608)		
R216	1-216-821-11	METAL CHIP	1K	5%	1/16W
R217	1-218-891-11	RES, CHIP	68K (1608)		
R219	1-218-887-11	RES, CHIP	47K (1608)		
R220	1-218-891-11	RES, CHIP	68K (1608)		
R221	1-216-005-00	METAL CHIP	15	5%	1/10W
R222	1-216-821-11	METAL CHIP	1K	5%	1/16W
R223	1-216-817-11	METAL CHIP	470	5%	1/16W
R226	1-216-817-11	METAL CHIP	470	5%	1/16W
R227	1-216-821-11	METAL CHIP	1K	5%	1/16W
R228	1-216-845-11	METAL CHIP	100K	5%	1/16W
R230	1-218-863-11	RES, CHIP	4.7K (1608)		
R231	1-218-879-11	RES, CHIP	22K (1608)		
R233	1-216-158-00	RES, CHIP	22 (3216)		
R234	1-216-857-11	METAL CHIP	1M	5%	1/16W
R235	1-216-821-11	METAL CHIP	1K	5%	1/16W
R236	1-218-871-11	RES, CHIP	10K (1608)		
R237	1-218-871-11	RES, CHIP	10K (1608)		
R238	1-218-871-11	RES, CHIP	10K (1608)		
R239	1-218-871-11	RES, CHIP	10K (1608)		
R240	1-218-871-11	RES, CHIP	10K (1608)		
R241	1-218-871-11	RES, CHIP	10K (1608)		
R242	1-218-827-11	RES, CHIP	150 (1608)		
R243	1-218-871-11	RES, CHIP	10K (1608)		
R244	1-218-871-11	RES, CHIP	10K (1608)		
R245	1-218-871-11	RES, CHIP	10K (1608)		
R246	1-218-827-11	RES, CHIP	150 (1608)		
R247	1-218-871-11	RES, CHIP	10K (1608)		
R248	1-218-895-11	RES, CHIP	100K (1608)		
R249	1-216-845-11	METAL CHIP	100K	5%	1/16W
R251	1-218-867-11	RES, CHIP	6.8K (1608)		
R252	1-218-855-11	RES, CHIP	2.2K (1608)		
R301	1-216-864-11	METAL CHIP	0	5%	1/16W
R307	1-216-813-11	METAL CHIP	220	5%	1/16W
R308	1-216-864-11	METAL CHIP	0	5%	1/16W
R309	1-216-864-11	METAL CHIP	0	5%	1/16W
R310	1-216-813-11	METAL CHIP	220	5%	1/16W
R311	1-216-813-11	METAL CHIP	220	5%	1/16W
R312	1-216-813-11	METAL CHIP	220	5%	1/16W
R313	1-216-864-11	METAL CHIP	0	5%	1/16W
R314	1-216-864-11	METAL CHIP	0	5%	1/16W
R315	1-216-864-11	METAL CHIP	0	5%	1/16W
R316	1-216-864-11	METAL CHIP	0	5%	1/16W
R317	1-216-864-11	METAL CHIP	0	5%	1/16W
R318	1-216-864-11	METAL CHIP	0	5%	1/16W
R320	1-216-837-11	METAL CHIP	22K	5%	1/16W
R321	1-216-864-11	METAL CHIP	0	5%	1/16W
R330	1-216-833-11	METAL CHIP	10K	5%	1/16W
R331	1-216-864-11	METAL CHIP	0	5%	1/16W
R332	1-216-864-11	METAL CHIP	0	5%	1/16W
R334	1-216-864-11	METAL CHIP	0	5%	1/16W
R350	1-216-857-11	METAL CHIP	1M	5%	1/16W
R901	1-216-851-11	METAL CHIP	330K	5%	1/16W
R902	1-216-851-11	METAL CHIP	330K	5%	1/16W

RADIAL REC

Ref. No.	Part No.	Description			Remarks
R903	1-249-476-11	CARBON	1.5	5%	1/2W F
R904	1-216-841-11	METAL CHIP	47K	5%	1/16W
R905	1-216-809-11	METAL CHIP	100	5%	1/16W
R906	1-218-895-11	RES, CHIP	100K (1608)		
R907	1-218-895-11	RES, CHIP	100K (1608)		
R910	1-216-821-11	METAL CHIP	1K	5%	1/16W
R911	1-216-853-11	METAL CHIP	470K	5%	1/16W
R912	1-216-845-11	METAL CHIP	100K	5%	1/16W
R913	1-216-853-11	METAL CHIP	470K	5%	1/16W
R914	1-216-853-11	METAL CHIP	470K	5%	1/16W
R915	1-218-883-11	RES, CHIP	33K (1608)		
R916	1-218-883-11	RES, CHIP	33K (1608)		
R917	1-218-871-11	RES, CHIP	10K (1608)		
R918	1-218-879-11	RES, CHIP	22K (1608)		
R919	1-218-891-11	RES, CHIP	68K (1608)		
R920	1-218-859-11	RES, CHIP	3.3K (1608)		
R922	1-218-847-11	RES, CHIP	1.0K (1608)		
R923	1-216-833-11	METAL CHIP	10K	5%	1/16W
R924	1-216-853-11	METAL CHIP	470K	5%	1/16W
R925	1-216-813-11	METAL CHIP	220	5%	1/16W
R926	1-216-845-11	METAL CHIP	100K	5%	1/16W
R927	1-216-843-11	METAL CHIP	68K	5%	1/16W
R928	1-216-821-11	METAL CHIP	1K	5%	1/16W
R929	1-216-833-11	METAL CHIP	10K	5%	1/16W
R930	1-216-813-11	METAL CHIP	220	5%	1/16W
R931	1-218-899-11	RES, CHIP	150K (1608)		
R932	1-218-899-11	RES, CHIP	150K (1608)		
R933	1-216-815-11	METAL CHIP	330	5%	1/16W
R934	1-216-833-11	METAL CHIP	10K	5%	1/16W
R935	1-218-887-11	RES, CHIP	47K (1608)		
R936	1-218-887-11	RES, CHIP	47K (1608)		
R937	1-218-887-11	RES, CHIP	47K (1608)		
R938	1-218-887-11	RES, CHIP	47K (1608)		
R939	1-216-864-11	METAL CHIP	0	5%	1/16W
R940	1-216-864-11	METAL CHIP	0	5%	1/16W
R941	1-216-864-11	METAL CHIP	0	5%	1/16W
R942	1-216-851-11	METAL CHIP	330K	5%	1/16W
R943	1-216-821-11	METAL CHIP	1K	5%	1/16W
R945	1-216-821-11	METAL CHIP	1K	5%	1/16W
R946	1-216-845-11	METAL CHIP	100K	5%	1/16W
R947	1-216-851-11	METAL CHIP	330K	5%	1/16W
R948	1-216-849-11	METAL CHIP	220K	5%	1/16W
R952	1-216-857-11	METAL CHIP	1M	5%	1/16W
R958	1-216-864-11	METAL CHIP	0	5%	1/16W
R960	1-247-729-11	CARBON	15	5%	1/2W F
R961	1-218-891-11	RES, CHIP	68K (1608)		
R964	1-216-797-11	METAL CHIP	10	5%	1/16W
R966	1-216-809-11	METAL CHIP	100	5%	1/16W
R967	1-216-831-11	METAL CHIP	6.8K	5%	1/16W
R969	1-216-857-11	METAL CHIP	1M	5%	1/16W
R970	1-218-899-11	RES, CHIP	150K (1608)		
R971	1-218-899-11	RES, CHIP	150K (1608)		
R973	1-216-851-11	METAL CHIP	330K	5%	1/16W
R974	1-216-851-11	METAL CHIP	330K	5%	1/16W
R975	1-216-851-11	METAL CHIP	330K	5%	1/16W
R976	1-216-851-11	METAL CHIP	330K	5%	1/16W
R977	1-218-887-11	RES, CHIP	47K (1608)		
R978	1-218-903-11	RES, CHIP	220K (1608)		
R979	1-218-899-11	RES, CHIP	150K (1608)		
R980	1-216-134-00	METAL CHIP	2.2	5%	1/8W
R981	1-216-134-00	METAL CHIP	2.2	5%	1/8W
R982	1-216-845-11	METAL CHIP	100K	5%	1/16W
R983	1-216-845-11	METAL CHIP	100K	5%	1/16W
R984	1-216-864-11	METAL CHIP	0	5%	1/16W
R986	1-216-851-11	METAL CHIP	330K	5%	1/16W
R987	1-216-851-11	METAL CHIP	330K	5%	1/16W
R988	1-216-851-11	METAL CHIP	330K	5%	1/16W
R989	1-216-851-11	METAL CHIP	330K	5%	1/16W
R990	1-216-864-11	METAL CHIP	0	5%	1/16W
R991	1-216-821-11	METAL CHIP	1K	5%	1/16W
R993	1-216-833-11	METAL CHIP	10K	5%	1/16W
R994	1-216-296-91	SHORT	0		
R995	1-218-875-11	RES, CHIP	15K (1608)		
R996	1-216-864-11	METAL CHIP	0	5%	1/16W
		< CONPOSITION CIRCUIT BLOCK >			
RB301	1-236-907-11	NETWORK RESISTOR (CHIP) 100K			
RB901	1-236-907-11	NETWORK RESISTOR (CHIP) 100K			
RB903	1-239-446-11	NETWORK RESISTOR (CHIP) 330K			
RB904	1-239-389-11	NWTWORK RESISTOR (CHIP) 47K			
		< VARIABLE RESISTOR >			
RV301	1-225-549-11	RES, VAR, CARBON 10K/10K (REC LEVEL (ANALOG))			
RV302	1-223-889-11	RES, VAR, CARBON 50K/50K (HEADPHONES-LEVEL)			
		< SWITCH >			
S951	1-771-218-11	SWITCH, MICRO (LION)			
S952	1-571-914-11	SWITCH, KEY BOARD (CLOCK SET)			
S953	1-771-218-11	SWITCH, MICRO (RELEASE)			
S954	1-572-473-11	SWITCH, TACTIL (RESET)			
		< TRANSFORMER >			
T901	1-431-542-11	TRANSFORMER, CONVERTER			
		< THERMISTOR(POSITIVE) >			
⚠THP901	1-810-792-11	THERMISTOR, POSITIVE			
		< VIBRATOR >			
X901	1-767-690-11	VIBRATOR, CERAMIC 10MHz			
**********					
	A-3293-755-A	REC BOARD			
		**********			
		< CAPACITOR >			
C401	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C402	1-107-810-11	TANTAL. CHIP	33uF	20%	4V
C403	1-109-814-11	CAPACITOR	220PF	5%	100V
		< DIODE >			
D401	8-719-046-86	DIODE F1J6TP			
D402	8-719-046-86	DIODE F1J6TP			

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

Ref. No.	Part No.	Description			Remarks
		< TRANSISTOR >			
Q401	8-729-024-44	TRANSISTOR 2SK2315TYTR			
Q402	8-729-024-44	TRANSISTOR 2SK2315TYTR			
Q403	8-729-024-44	TRANSISTOR 2SK2315TYTR			
Q404	8-729-024-44	TRANSISTOR 2SK2315TYTR			
**********					
*	1-667-231-11	STATION CN BOARD			
		**********			
		< CONNECTOR >			
CN655	1-766-559-21	CONNECTOR, FFC/FPC(NON-ZIF)22P			
		< RESISTOR >			
R620	1-216-864-11	METAL CHIP	0	5%	1/16W
R622	1-216-864-11	METAL CHIP	0	5%	1/16W
R623	1-216-864-11	METAL CHIP	0	5%	1/16W
R624	1-216-864-11	METAL CHIP	0	5%	1/16W
R921	1-216-864-11	METAL CHIP	0	5%	1/16W
**********					
*	1-667-233-11	STATION SW1 BOARD			
		**********			
	3-708-377-01	SLIDER, SURF LOCK (16P)			
		< CONNECTOR >			
* CN602	1-569-529-11	HOUSING, CONNECTOR 14P			
CN603	1-569-530-11	HOUSING, CONNECTOR 16P			
		< RESISTOR >			
R608	1-218-867-11	RES, CHIP	6.8K (1608)		
R609	1-218-871-11	RES, CHIP	10K (1608)		
R610	1-218-867-11	RES, CHIP	6.8K (1608)		
R611	1-218-871-11	RES, CHIP	10K (1608)		
R612	1-218-875-11	RES, CHIP	15K (1608)		
R613	1-218-883-11	RES, CHIP	33K (1608)		
R614	1-218-887-11	RES, CHIP	47K (1608)		
R615	1-218-867-11	RES, CHIP	6.8K (1608)		
R616	1-218-871-11	RES, CHIP	10K (1608)		
R617	1-218-875-11	RES, CHIP	15K (1608)		
R618	1-218-883-11	RES, CHIP	33K (1608)		
R619	1-218-887-11	RES, CHIP	47K (1608)		
R625	1-216-833-11	METAL CHIP	10K	5%	1/16W
R626	1-216-833-11	METAL CHIP	10K	5%	1/16W
R628	1-216-833-11	METAL CHIP	10K	5%	1/16W
R629	1-216-833-11	METAL CHIP	10K	5%	1/16W
		< SWITCH >			
S615	1-771-053-21	SWITCH, KEY BOARD (CAPS)			
S616	1-771-053-21	SWITCH, KEY BOARD (➡)			
S617	1-771-053-21	SWITCH, KEY BOARD (⬅)			
S618	1-771-053-21	SWITCH, KEY BOARD (DISPLAY)			

Ref. No.	Part No.	Description			Remarks
S619	1-771-053-21	SWITCH, KEY BOARD (MODE)			
S620	1-771-053-21	SWITCH, KEY BOARD (UNDO)			
S621	1-771-053-21	SWITCH, KEY BOARD (TRACK MARK)			
S622	1-771-053-21	SWITCH, KEY BOARD (MOVE/INSERT)			
S623	1-771-053-21	SWITCH, KEY BOARD (ERASE/DELETE)			
S624	1-771-053-21	SWITCH, KEY BOARD (TITLE/ENTER)			
S625	1-771-053-21	SWITCH, KEY BOARD (SELECT)			
S626	1-771-053-21	SWITCH, KEY BOARD (INPUT POSITION ➡)			
S627	1-771-053-21	SWITCH, KEY BOARD (INPUT POSITION ⬅)			
S628	1-771-053-21	SWITCH, KEY BOARD (⬆)			
S629	1-771-053-21	SWITCH, KEY BOARD (⬇)			
**********					
*	1-667-234-11	STATION SW2 BOARD			
		**********			
		< CONNECTOR >			
* CN601	1-569-529-11	HOUSING, CONNECTOR 14P			
		< RESISTOR >			
R601	1-218-867-11	RES, CHIP	6.8K (1608)		
R602	1-218-871-11	RES, CHIP	10K (1608)		
R603	1-218-867-11	RES, CHIP	6.8K (1608)		
R604	1-218-871-11	RES, CHIP	10K (1608)		
R605	1-218-875-11	RES, CHIP	15K (1608)		
R606	1-218-883-11	RES, CHIP	33K (1608)		
R630	1-216-864-11	METAL CHIP	0	5%	1/16W
R631	1-216-864-11	METAL CHIP	0	5%	1/16W
R632	1-216-864-11	METAL CHIP	0	5%	1/16W
		< SWITCH >			
S601	1-771-053-21	SWITCH, KEY BOARD (TIME MACHINE REC)			
S602	1-771-053-21	SWITCH, KEY BOARD (ACTIVE SP LEVEL+)			
S603	1-771-053-21	SWITCH, KEY BOARD (ACTIVE SP LEVEL–)			
S604	1-771-053-21	SWITCH, KEY BOARD (■)			
S605	1-771-053-21	SWITCH, KEY BOARD (⏮)			
S606	1-771-053-21	SWITCH, KEY BOARD (⏭)			
S607	1-771-053-21	SWITCH, KEY BOARD (⏸)			
S608	1-771-053-21	SWITCH, KEY BOARD (END SEARCH)			
S609	1-771-053-21	SWITCH, KEY BOARD (POWER)			
S610	1-771-053-21	SWITCH, KEY BOARD (▷)			
S611	1-572-467-41	SWITCH, PUSH (1 KEY) (REC)			
S612	1-762-079-11	SWITCH, SLIDE (INPUT)			
S613	1-762-079-11	SWITCH, SLIDE (TIMER)			
S614	1-762-078-11	SWITCH, SLIDE (SYNCREC)			
S630	1-572-467-41	SWITCH, PUSH (1 KEY) (PUSH OPEN)			
**********					

SW

Ref. No.	Part No.	Description	Remarks
*	1-667-219-11	SW BOARD *********	
		< RESISTOR >	
R844	1-218-867-11	RES, CHIP 6.8K (1608)	
R845	1-218-871-11	RES, CHIP 10K (1608)	
		< SWITCH >	
S801	1-572-921-11	SWITCH, KEY BOARD (▮▮)	
S802	1-572-921-11	SWITCH, KEY BOARD (END. SEARCH)	
S803	1-572-921-11	SWITCH, KEY BOARD (TRACK MARK)	
**********			
		MISCELLANEOUS **********	
	1-778-356-11	CONNECTOR, CONTACT	
58	1-475-368-11	SW UNIT	
63	1-782-708-11	WIRE (FLAT TYPE) (20 CORE)	
101	1-667-210-11	MD FLEXIBLE BOARD	
104	1-667-690-11	CLV FLEXIBLE BOARD	
⚠117	X-4949-256-1	OPTICAL PICK-UP ASSY (KMS-280A/JZN)	
136	1-667-211-11	MOTOR FLEXIBLE BOARD	
* 154	1-528-797-11	BATTERY, NI-CD	
158	1-801-897-11	ELEMENT, EL LUMINOUS	
161	1-667-281-11	LCD/EL FLEXIBLE BOARD	
187	1-782-719-11	WIRE (FLAT TYPE) (14 CORE)	
189	1-782-851-11	WIRE (FLAT TYPE) (16 CORE)	
201	1-782-852-11	WIRE (FLAT TYPE) (22 CORE)	
218	1-782-850-11	WIRE (FLAT TYPE) (6 CORE)	
LCD801	1-801-903-11	LCD	
LCD901	1-801-898-11	LCD MODULE	
M901	1-763-011-11	MOTOR	
M902	A-3311-972-A	MOTOR BLOCK ASSY, SLED	
M903	A-3320-037-A	STEPPER BLOCK ASSY	
M931	A-3304-761-A	MOTOR ASSY	
**********			

Ref. No.	Part No.	Description	Remarks
		ACCESSORIES & PACKING MATERIALS **********	
	3-860-705-11	MANUAL, INSTRUCTION (ENGLISH, FRENCH, GERMAN, SPANISH)	
	3-860-705-41	MANUAL, INSTRUCTION (JAPANESE, CHINESE, KOREAN)	
	X-3329-657-1	ATTACHMENT ASSY	
	X-3329-657-1	ATTACHMENT	
	1-475-375-21	REMOTE CONTROL UNIT (RM-MZR50)	
	1-475-455-11	ADAPTOR, AC (AC-MZR5ST)	
	1-569-007-11	ADAPTOR, CONVERSION 2P	
	1-759-277-21	CASE, BATTERY (EBP-MZR4)	
	3-704-275-01	BAG (STANDARD), PROTECTION	
	4-972-888-01	CASE, CARRYING	
	8-917-614-90	REMOTE COMMANDER RMT-CR5ST SET	
	8-953-218-90	HEADPHONE MDR-E838SP//K SET	
**********			
		********** HARDWARE LIST **********	
#1	7-685-104-11	SCREW +P 2 × 6 TYPE2 NON-SLIT	
#2	7-685-135-14	SCREW +P 2.6 × 10 TYPE2 NON-SLIT	
#3	7-627-554-07	SCREW,PRECISION +P 2 × 2.2	
#4	7-685-105-14	SCREW,PRECISION +P 2 × 8 TYPE2 NON-SLIT	

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

9-923-279-11

Sony Corporation
Personal A&V Products Company

97L1670031-1
Printed in Singapore © 1997.12
Published by Quality Engineering Dept.
(Shibaura)

NEW TECHNICAL THEORY FOR SERVICING

MZ-R5ST
OPERATION MANUAL

PORTABLE MINI DISC RECORDER

SONY®

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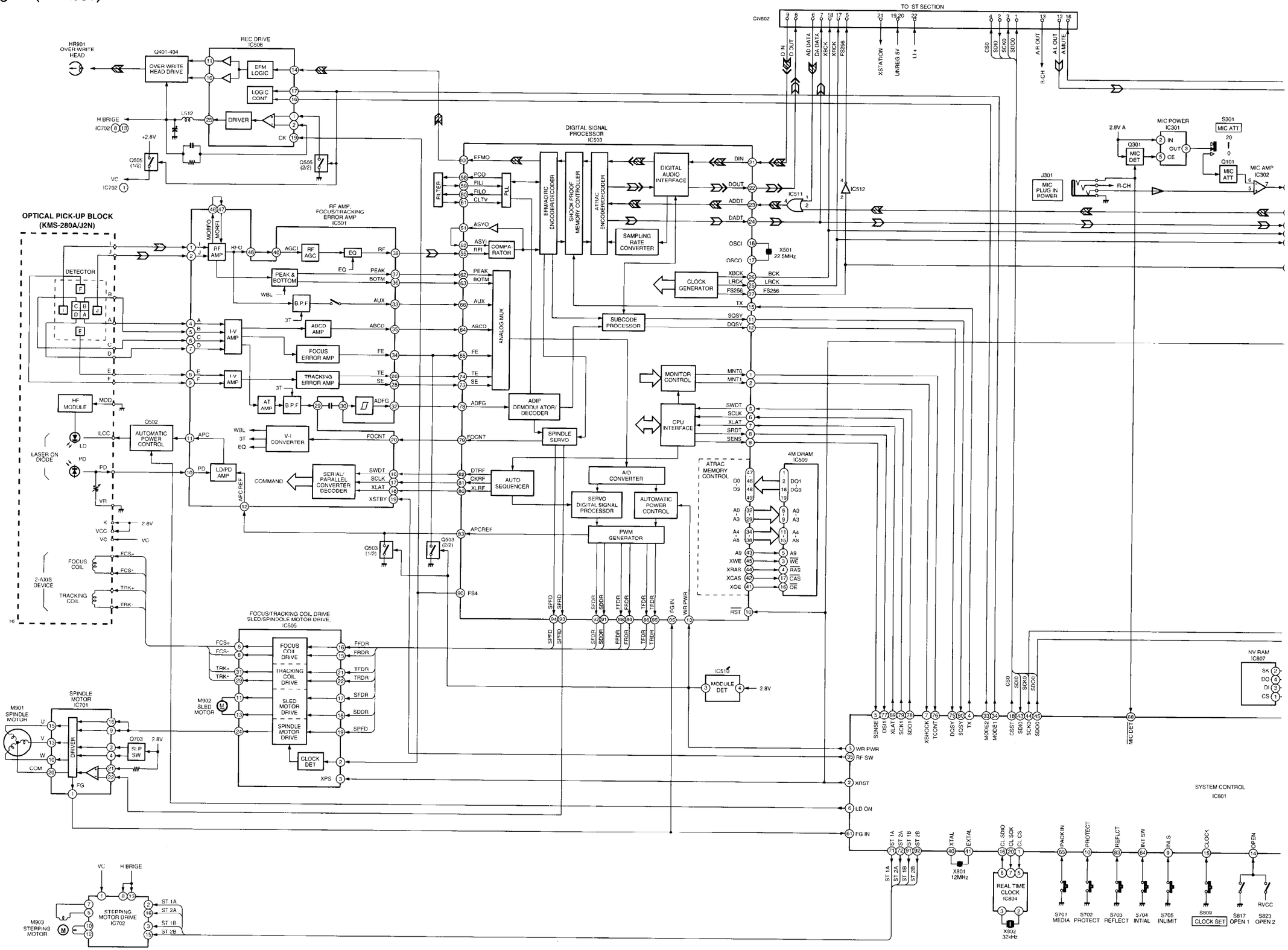
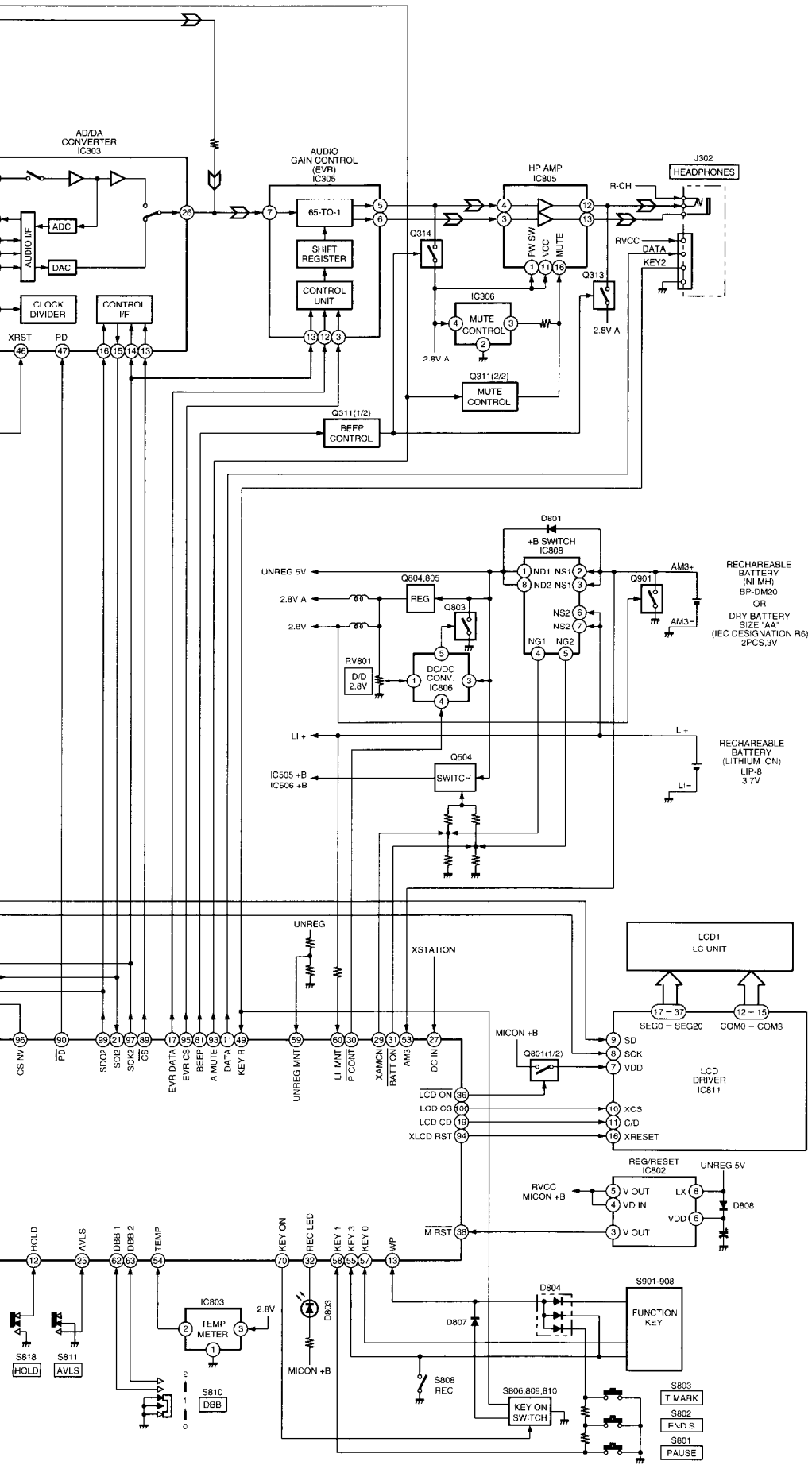
This NEW TECHNICAL THEORY FOR SERVICING describes theory of station (MZS-R5ST) and power supply circuit of MiniDisc recorder (MZ-R5ST).
Refer to MZ-R30 NEW TECHNICAL THEORY FOR SERVICING for theory of MiniDisc recorder.

1. BLOCK DIAGRAMS

1-1. Block Diagram (MZ-R5ST)





• Signal path.

: PB

: REC

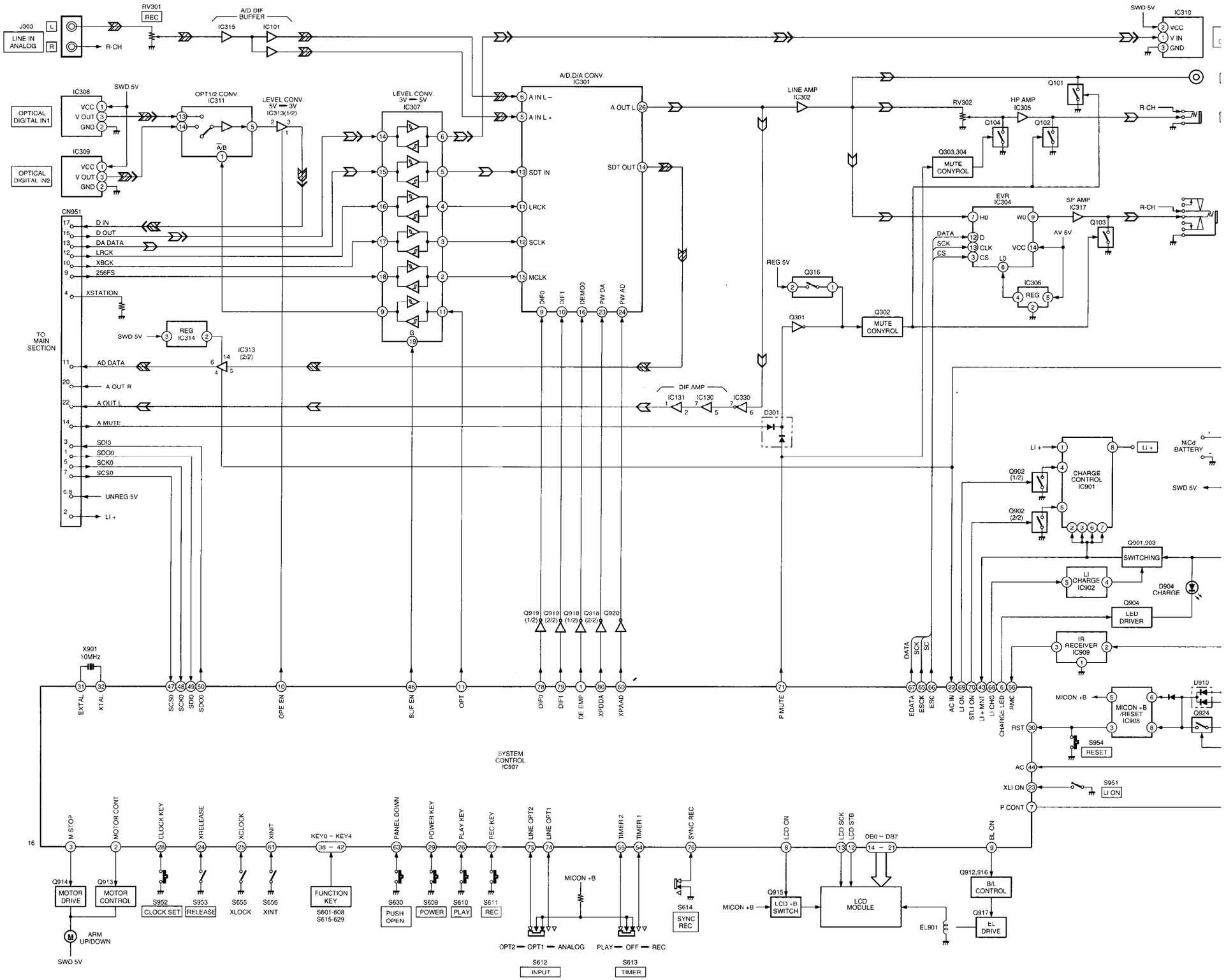
: PB (DIGITAL OUT)

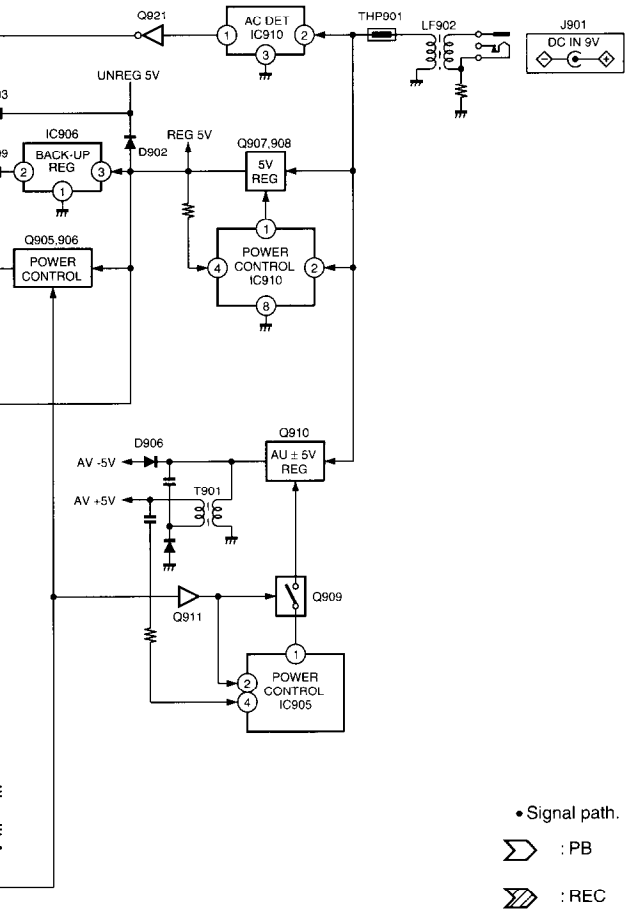
: REC (DIGITAL IN)

: MIC

• R-channel is omitted.

1-2. Block Diagram (MZS-R5ST)





• Signal path.

: PB

: REC

: PB (DIGITAL OUT)

: REC (DIGITAL IN)

• R-channel is omitted.

2. FUNCTIONS AND FEATURES

MZ-R5ST is the new Sony portable MiniDisc Recorder of the fourth generation using the wide bit stream technology that is the first in the world as a portable MiniDisc Recorder. MZ-R5ST has the following functions and features.

- Compact and slim recording/playback unit : The MiniDisc Recorder is made small and compact as it has the limited functions of playback and recording (microphone recording only), and the editing function is handled by the station. Thus the size as thin as 20.1 mm and as light as 185 g (almost equal to the conventional potable MD player) is realized.

- Built-in Sampling Rate Converter : MZ-R5ST has the built-in sampling rate converter that enables recording from digital equipment using other sampling rates as DAT deck or a satellite tuner. (Sampling frequencies: 32 kHz, 44.1 kHz and 48 kHz are supported)

- Wide Bit Stream Technology : The input circuit, the output circuit and their peripheral circuits operate on the 20-bit audio data so that the maximum performance of the ATRAC IC which operates on 20-bit and higher can be fully utilized.

- Synchronous Recording Function : When dubbing digital signal from a source digital equipment such as CD player to MZ-R5ST using optical digital cable, operation is simple without the need to operate both the source side equipment and this unit.

- Time Machine Recording Function : Time Machine recording always stores the input sound into the DRAM IC in MZ-R5ST so that the sound that is two seconds ahead of pressing the record button can be recorded. This functions convenient not to miss recording of the very beginning of the program when recording off-the-air program of satellite broadcast or FM broadcast.

- Built-in Rehearsal Function : Editing points can be checked in units of 0.06 seconds in the range of 256 steps (total 8 seconds) from –128 step to +127 step centering around the editing point. This function is convenient in the editing such as Divide editing.

- Built-in UNDO Function : UNDO function lets operator undo an editing operation when operator makes an operational error.,

- Output Jack For Active Speakers : The STEREO-MINI output terminal for active speakers is equipped. Sound volume of the active speakers can be controlled by key operation of station or key operation of remote controller.

Differences of functions between the 4th generation MiniDisc recorder (MZ-R30) and MZ-R5ST are shown below.

Table 2-1 Comparison of functions between the 4th generation MiniDisc recorder (MZ-R30) and MZ-R5ST

Functions of MiniDisc recorder	MZ-R5ST	MZ-R30
Headphones output	○	○
LINE output	MiniDisc recorder : × Station side : ○	○
Digital output	MiniDisc recorder : × Station side : ◎	×
Active speaker output	◎	×
LINE input	MiniDisc recorder : × Station side : ○	○
Digital input	MiniDisc recorder : × Station side : ◎ (2 inputs)	○ (1 input)
Microphone input	MiniDisc recorder : ○ (External stereo) Station side : ×	○ (External stereo)
AVLS	○	○
DBB (Digital Bass Boost)	○	○
RESUME	○ (Always ON)	○ (Always ON)
BEEP	○	○
Monaural recording	○	○
Monaural playback	○	○
Automatic track mark	○	○
Character input	○	○
Sampling rate converter	MiniDisc recorder : ○ Station side : ×	○
20-bit wide bit stream	◎	×
Synchro-recording	◎	○
Time Machine recording	◎	×
Timer standby function	◎	×
Program playback	◎	×
Rehearsal function	◎	×
Undo function	◎	×

Note : The mark ◎ in the table indicates the new functions.

3. CIRCUIT THEORY OF MZ-R5ST STATION

3-1. System Configuration

(1) System Configuration of MiniDisc Recorder (MZ-R5ST).

Fig. 3-1 shows system configuration (MZ-R5ST). MiniDisc recorder (MZ-R5ST) is described briefly as follows.

First, the flow of signals during recording is described. The MIC IN signal that is passed through the microphone amplifier IC302 inputs the AD/DA converter IC303 where the microphone signal is converted to the 16-bit digital data by a built-in A/D converter. The digital signal is sent to the DSP IC503 via the OR gate IC511. During LINE recording , the 20-bit digital data that is A/D converted by the station (MZS-R5ST) (refer to the next section of this manual (2) System Configuration of Station (MZS-R5ST) for more details), is input to the DSP IC503 via the OR gate IC511. The other input that is the DIGITAL IN input signal, is input directly to the DSP IC503 . At IC503, signal processing (compression, interleaving, EFM modulation, etc.) is performed on the input digital data to generate the EFM signal. The EFM signal thus generated is recorded on the MO disc via the REC DRIVE IC506.

Next, the flow of signals during playback is described. The EFM signal that is read by the optical pickup is input to the DSP IC503 via the RF amplifier IC501. At IC503, signal processing (EFM demodulation, de-interleaving, expansion, etc.) is performed on the input EFM signal to generate the DA data. When the MiniDisc recorder (MZ-R5ST) is used as a stand-alone unit, the DA data is sent to the AD/DA converter IC303 where the DA data is passed through the internal DBB (Digital Bass Boost) circuit, digital filter and is converted to the L-channel and R-channel analog signal by D/A converter. The D/A converted L-channel and R-channel analog signal passes through the audio gain control IC305, headphones amplifier IC805 and then to HEADPHONES. When station unit is connected, the DA data is output to the AD/DA converter IC301 of the station connected.

Next, the flow of the servo signals is described below. The error signals that are read by optical pickup are sent to the DSP IC503 after passing the various error amplifiers inside the RF amplifier IC501. In the DSP IC503, the input error signals are performed the servo calculations by the internal digital servo processor to generate the servo signal. The servo signals are then output and used to drive coils and motors via the coil/motor drive IC505.

The system controller IC801 is described lastly. The system controller IC801 controls the whole system of the MZ-R5ST. The main control functions of the respective ICs and the input signals that are controlled by the system controller IC 801 are shown below.

◆ Controls the DSP IC503 : • Control of the respective servo processings.
• Selection of mode (recording or playback) of the respective signal processing blocks
• Control of input sound source (AD data or digital data), etc.
◆ Controls the RF amplifier : Selection of mode (PIT or GROOVE) of the RF amplifier, etc.
◆ Controls the audio gain control IC305 : Control of the output volume
◆ Controls the AD/DA converter IC303 : Control of the DBB circuit, etc.
◆ Controls the NV RAM IC807: Control of the E-F balance values during servo processing
◆ Controls the stepping motor drive IC702
◆ Controls the REC DRIVE IC506
◆ Communication with the system controller IC907 of station unit
◆ Controls the input signals from keys and switches
◆ Controls temperature inside the MiniDisc recorder
◆ Controls the clock information
◆ Drives LCD

(2) System Configuration of Station (MZS-R5ST).

Fig. 3-2 shows system configuration (MZS-R5ST). Station (MZS-R5ST) is described briefly as follows.

First, the flow of signals during recording is described . When station (MZS-R5ST) is in the LINE recording mode, the L-channel and R-channel analog signals that are input from the LINE IN JACK J303 are sent to the AD/DA converter IC301 via the LINE amplifier IC315, the differential buffers IC101 and IC201. The LINE input signal is converted to the 20-bit digital data by the A/D converter inside IC301. The 20-bit digital data is output to MiniDisc recorder (MZ-R5ST). The digital recording mode is described next. The station (MZS-R5ST) has the two channel digital inputs. The digital signal that is input from the DIGITAL IN is sent to the DIN selector IC311. The station (MZS-R5ST) has the recording source selector switch. When operator operates the recording source selector switch, result of selection is input to the system controller IC907 so that IC907 recognizes the selected recording source and controls the selector switch inside the DIN selector IC311. Thus the digital data that is going to be output to MiniDisc recorder (MZ-R5ST), is determined. The digital data that is selected by the DIN selector IC311 is output to MiniDisc recorder (MZ-R5ST) via the level converter IC313.

Next, the flow of signals during playback is described. The DA data that is output from the DSP IC503 of MiniDisc recorder (MZ-R5ST), is input to the AD/DA converter IC301 where the DA data is passed through the digital filter and is converted to the L-channel and R-channel analog signals by D/A converter. The D/A converted L-channel and R-channel analog signals are output to the LINE OUT jack J304 via the LINE amplifier IC302, output to the HEADPHONES OUT jack J302 via the LINE OUT amplifier IC302, PB VOLUME RV302 and headphones amplifier IC305. The D/A converted L-channel and R-channel analog signals are also output to the ACTIVE SPEAKER OUT jack J301 via the LINE OUT amplifier IC302 and buffer IC317, and is at the same time output to the AUDIO GAIN control IC305 of MiniDisc recorder (MZ-R5ST) via a differential amplifier.

The system controller IC907 is described lastly. The system controller IC907 controls the whole system of MZS-R5ST. The main control functions of the respective ICs and the input signals that are controlled by the system controller IC907 are shown below.

- ◆ Controls the DIN selector IC311 : Control of the digital data (DIN1 or DIN2) that is going to be output to MiniDisc recorder (MZ-R5ST)
- ◆ Controls the level converter : Selection of POWER ON/OFF
- ◆ Controls the EVR IC304 : Control of the output volume for active speakers
- ◆ Controls the AD/DA converter IC301 : Control of ON/OFF of the A/D converter and D/A converter, etc.
- ◆ Communication with the system controller IC801 of MiniDisc recorder (MZ-R5ST)
- ◆ Controls the input signals from keys and switches
- ◆ Drives LCD

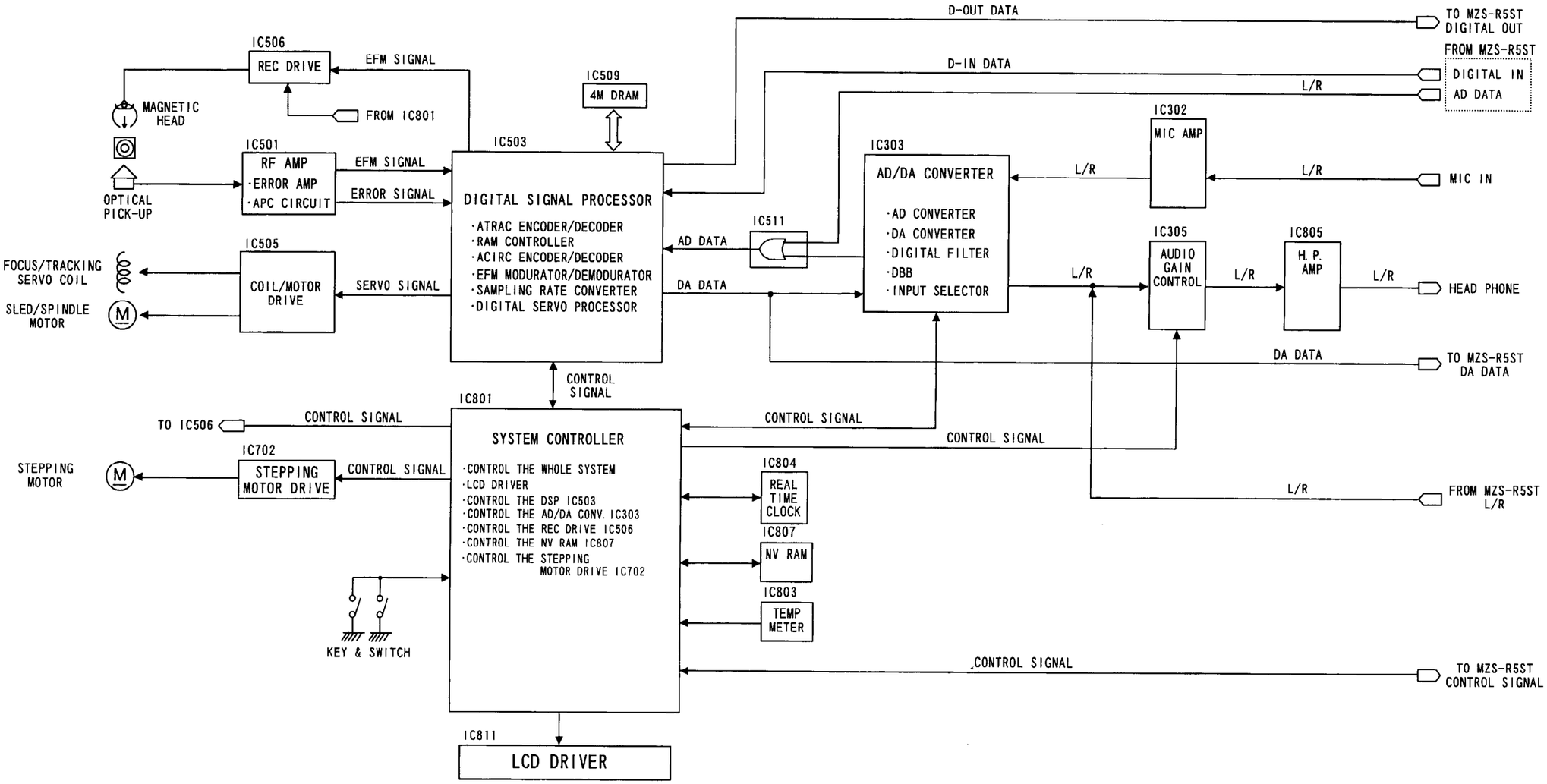


Fig. 3-1 System configuration(MZ-R5ST)

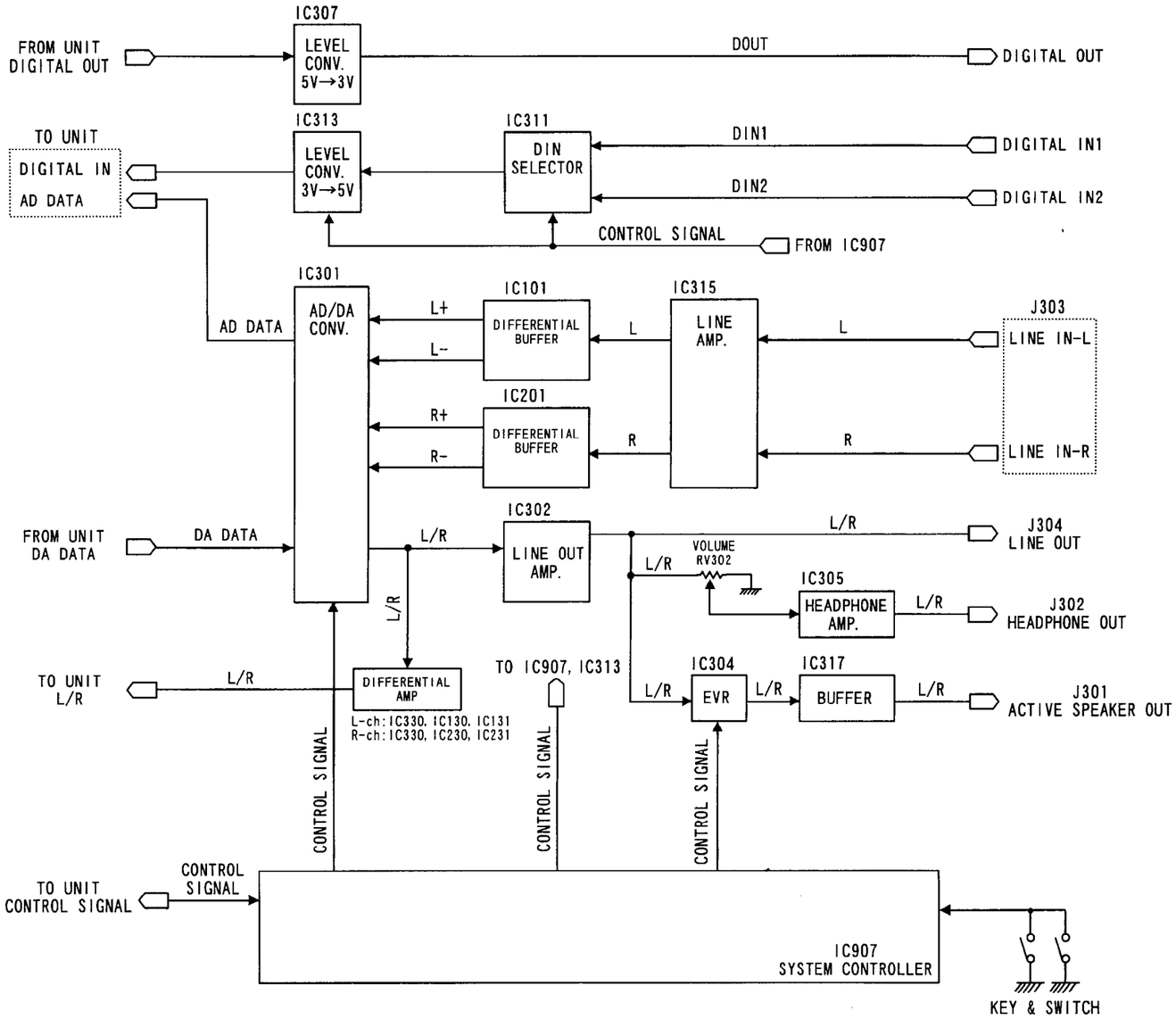


Fig. 3-2 System configuration(MZS-R5ST)

3-2. Microprocessor Interface

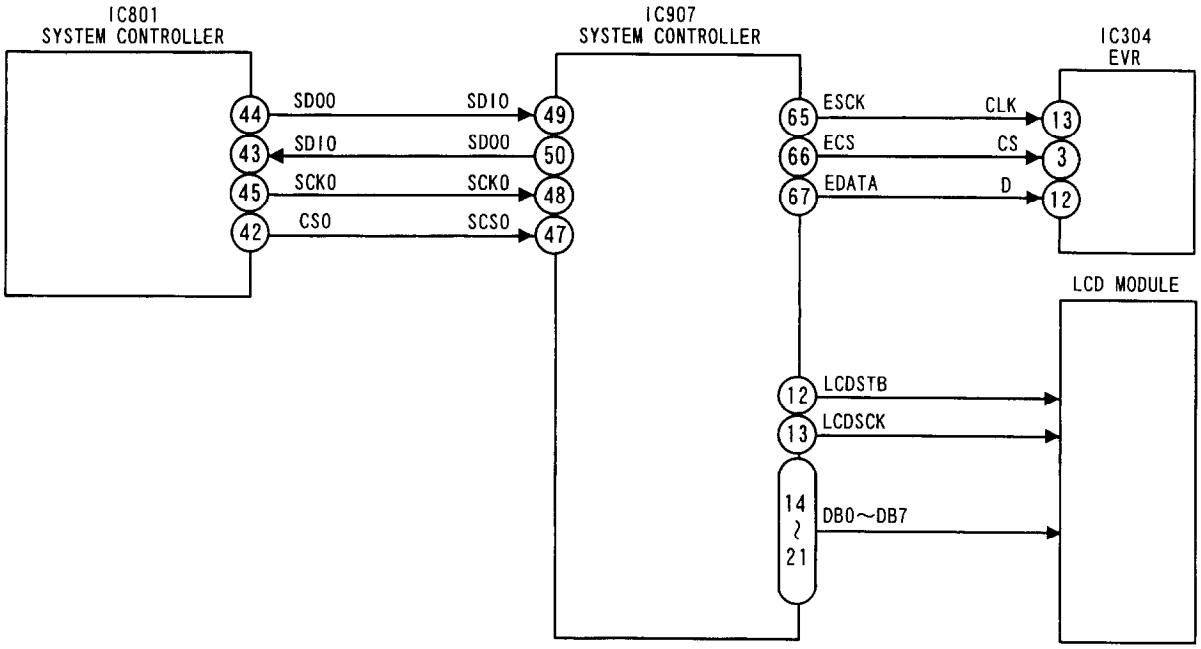


Fig. 3-3 Microprocessor interface

Fig. 3-3 shows microprocessor interface between station unit and MiniDisc recorder.

1. Communication between system controller IC801 and IC907

The system controller IC801 of MiniDisc recorder sends the various commands in the form of serial data to the system controller IC907 of station in order to establish communication between them. These serial data are output from IC801 pin㊹ [SD00] to the system controller IC907 of station, in synchronization with clock signal that is output from pin㊺ [SCK0] and chip select signal from pin㊷ [CS0]. The system controller IC907 of station reads the serial data and executes the operations in accordance with the input serial data. When the data-read command is issued, the data that corresponds to the command, is output from pin㊿ [SD00] in synchronization with the clock that is input to pin㊽ [SCK0].

The main interfaces are shown below.

◆ From system controller IC907 (station) → System controller IC801 (MiniDisc recorder)

- Input data from operation keys
- Selection of recording mode (Stereo/Monaural, Digital/Analog), etc.

◆ From system controller IC801 (MiniDisc recorder) → System controller IC907 (station)

- Presence or absence of rechargeable lithium-ion battery
- LCD display data
- Time information
- Disc information (Presence or absence of disc, CD or MO, copy protection) etc.

2. Communication between system controller IC907 and EVR IC304

When the system controller IC907 detects that the active speaker VOLUME key is pressed at pin㊶ [KEY3] or pin㊻ [RMC] input, IC907 outputs data from pin㊼ [EDATA] to EVR IC304 in synchronization with the clock at pin㊺ [ESCK] and the chip select signal at pin㊻ [ECS]. Output data from IC907 controls the output signal from ACTIVE SPEAKER OUT J301.

3. Communication between system controller IC907 and LCD block

The system controller IC907 controls the display data by transferring data to the LCD module through the 8 parallel data. The display data is output from the eight data output pins of pin⑭ [DB0] through pin㉑ [DB7], to the LCD module in synchronization with clock at pin⑬ [LCD SCK] and the strobe signal at pin⑫ [LCD STB].

3-3. Power Supply Circuit

Fig. 3-4 shows a block diagram of the power supply circuit (MZS-R5ST).

(1) Generating the UNREG power supply voltage

When the DC plug is inserted to the DC jack, 9 V is input to POWER CONTROL1 IC904 pin② [VCC] via a line filter LF902, which starts up IC904. As IC904 starts up, the PWM waveform that is generated by the internal PWM comparator, is output from pin① [OUT]. Q908 and Q907 start switching operation as a result of this PWM waveform output, and the step-down DC-DC converter circuit is started up. After the Q907 output is smoothed by D905, L903 and C908, the voltage resistance-divided by R915 to R917 is fed back to pin④ [INPUT] of IC904. Based on this feedback voltage, IC904 controls the voltage by controlling the PWM wave duty generated by the PWM comparator inside. As a result of this operation, the UNREG 5 V is generated. (Refer to Fig. 3-7 and Fig. 3-8.)

(2) Generating the 2.9 V for system controller IC801

The UNREG voltage that is generated by the UNREG power generating circuit, is input to the RESET IC908 pin⑥ [VDD]. When IC908 starts up, 2.9V is generated by the internal step-up/step-down regulator. And 2.9V is output from pin⑤. The output 2.9 V is input to the system controller IC907 pin⑫ [VDD] to start up the system controller IC907.

(3) Generating the SWD 5 V

When system controller IC907 starts up, IC907 detects whether MiniDisc recorder (MZ-R5ST) is connected to station or not, from state of pin㉕ [XLOCK] ("L": when MiniDisc recorder is connected). When MiniDisc recorder is connected to station, and when the POWER key S609 is pressed to set the pin㉙ [POWERKEY] input to "L", the system controller IC907 outputs "H" from pin⑦ [PCONT]. Q906 and Q905 are turned "ON" by this "H" signal so that the UNREG voltage is supplied as the SWD 5 V to the respective ICs such as DIN SELECTOR IC311 and others. When MiniDisc recorder has not been connected to station and is connected later, output from IC907 pin⑦ [PCONT] goes to "H" immediately.

Fig. 3-5 shows the timing chart when the POWER key is pressed with MiniDisc recorder connected to station.

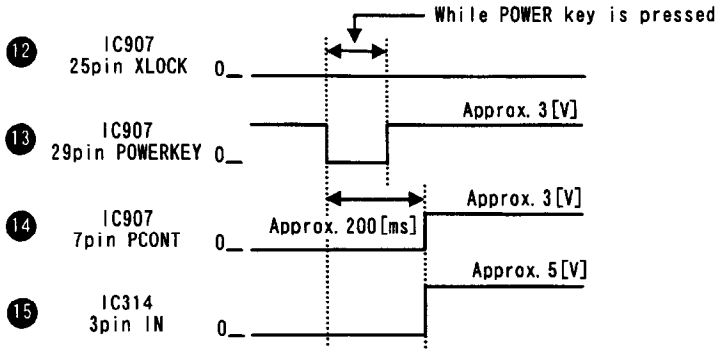


Fig. 3-5 Timing chart when the POWER key S609 is pressed

(4) Generating the 2.9 V for the level converter IC313

The SWD 5 V is supplied to the 2.9 V REG IC314 pin③ [IN] to start up IC314. As IC314 is started up, the 2.9 V is generated by internal series regulator and is output from pin② [OUT]. The 2.9 V is output to the level converter IC313 as its startup voltage.

(5) Generating the AUDIO ±5 V

Fig. 3-6 shows the waveform timing chart when generating the AUDIO ±5 V. When the system controller IC907 is started with MiniDisc recorder connected to station, "H" signal is output from pin⑦ [PCONT]. Q911 (1/2) and (2/2) are turned "ON" by this "H" signal so that the 9 V that is input to the DC jack, is supplied to the POWER CONTROL2 IC905 pin② [VCC] through the line filter LF902 and L904. When IC905 starts up, the PWM waveform that is internally generated by the built-in PWM comparator, is output from pin① [OUT]. Q910 is started the switching operation by this PWM waveform, and the step-down DC-DC converter circuit is started up. Then output of Q910 (refer to ❻ of Fig. 3-6) is input to T901 where its energy is converted (refer to ❼ of Fig. 3-6), smoothed by T901 coil and C911 to generate +5 V (refer to ❽ of Fig. 3-6). The +5 V is voltage-divided by the voltage-divider-resistor of R918 to R920, R955 and R922. Output voltage from the divider is fed back to IC905 pin④ [INPUT]. Based on this feedback voltage, IC905 controls the voltage by controlling the PWM waveform duty generated by the internal PWM comparator. The AUDIO +5 V is thus generated. The AUDIO +5 V is supplied to the AUDIO circuit via smoothing circuit of L902 and C906. (Refer to Fig. 3-9.)

Output of Q910 (refer to ❻ of Fig. 3-6) is smoothed out by D906 and a negative voltage power is generated. (Refer to ❿ of Fig. 3-6.) The negative voltage power is removed of ripple by L901, C905 and C909, and the AUDIO –5 V (Refer to ⓫ of Fig. 3-6.) is generated. (Refer to Fig. 3-9.)

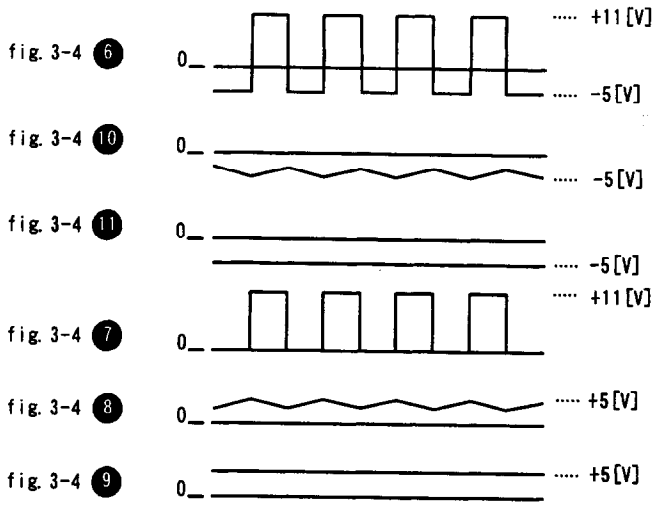


Fig. 3-6 Waveform timing when generating the AUDIO ±5 V

(6) Generating 2.5 V to be used inside EVR IC304

When the AUDIO +5 V is input to pin⑥[IN] of the 2.5 V REG. IC306. The 2.5V is generated by the internal series regulator. The 2.5 V is output from pin④ [OUT] and used as the internal power supply voltage of EVR IC304.

(7) Operation of voltage detector IC910

Whether AC power is input to station or not, is detected at pin㉒ [ACIN] of the system controller IC907. ("L": when AC power is connected.) The voltage detector IC910 is installed in order to change the port input of pin㉒ [ACIN] earlier, when AC power cord is removed from station. When input to IC910 pin② becomes lower than 4.5 V, FET inside IC910 is turned on so that "L" is output from pin①. Q921 is turned off by this "L" signal. And "H" is input to pin㉒ [ACIN] of system controller IC907 .

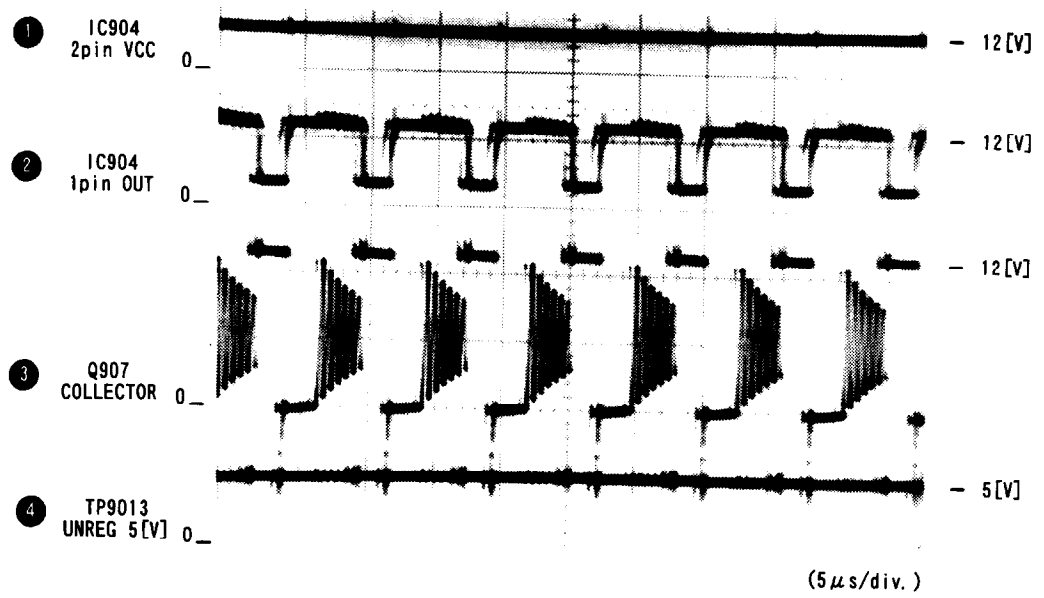


Fig. 3-7 UNREG power supply voltage generator circuit waveform timing chart
(when MiniDisc recorder is not connected to station)

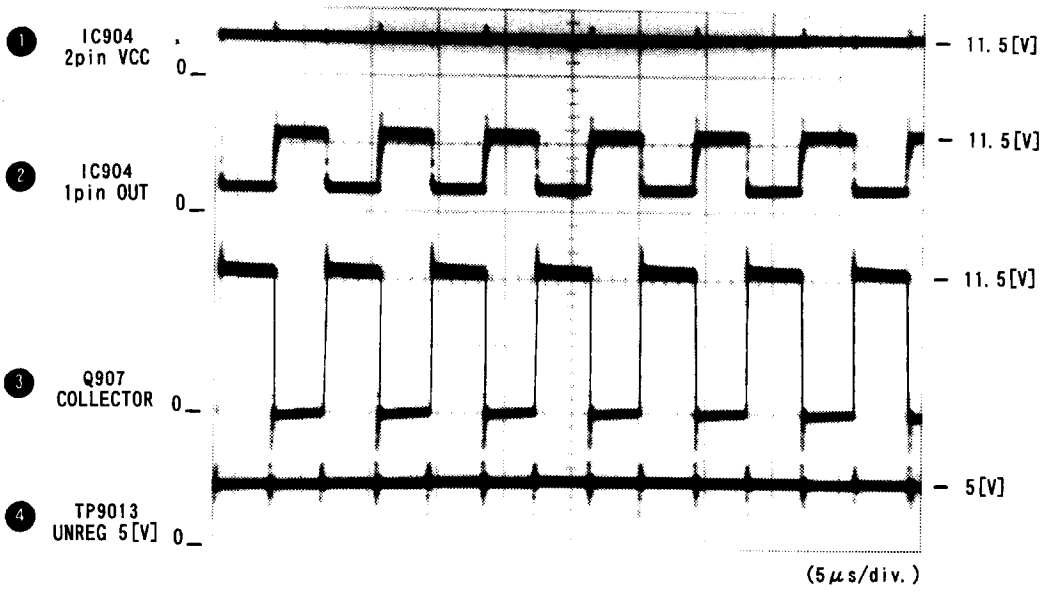


Fig. 3-8 UNREG power supply voltage generator circuit waveform timing chart
(when MiniDisc recorder is connected to station)

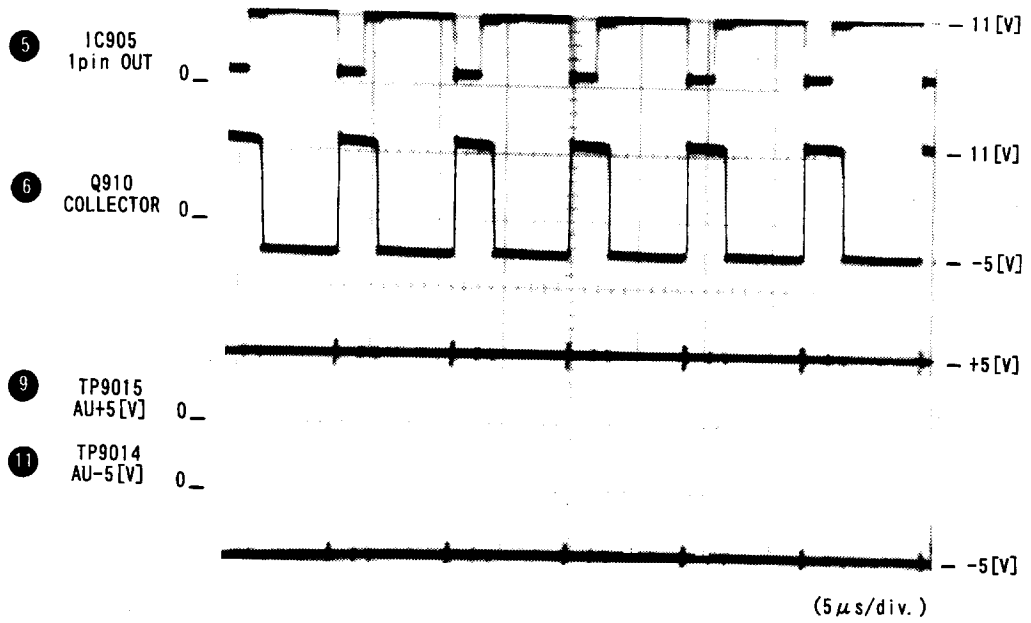


Fig. 3-9 AUDIO ±5 V power supply voltage generator circuit waveform timing chart

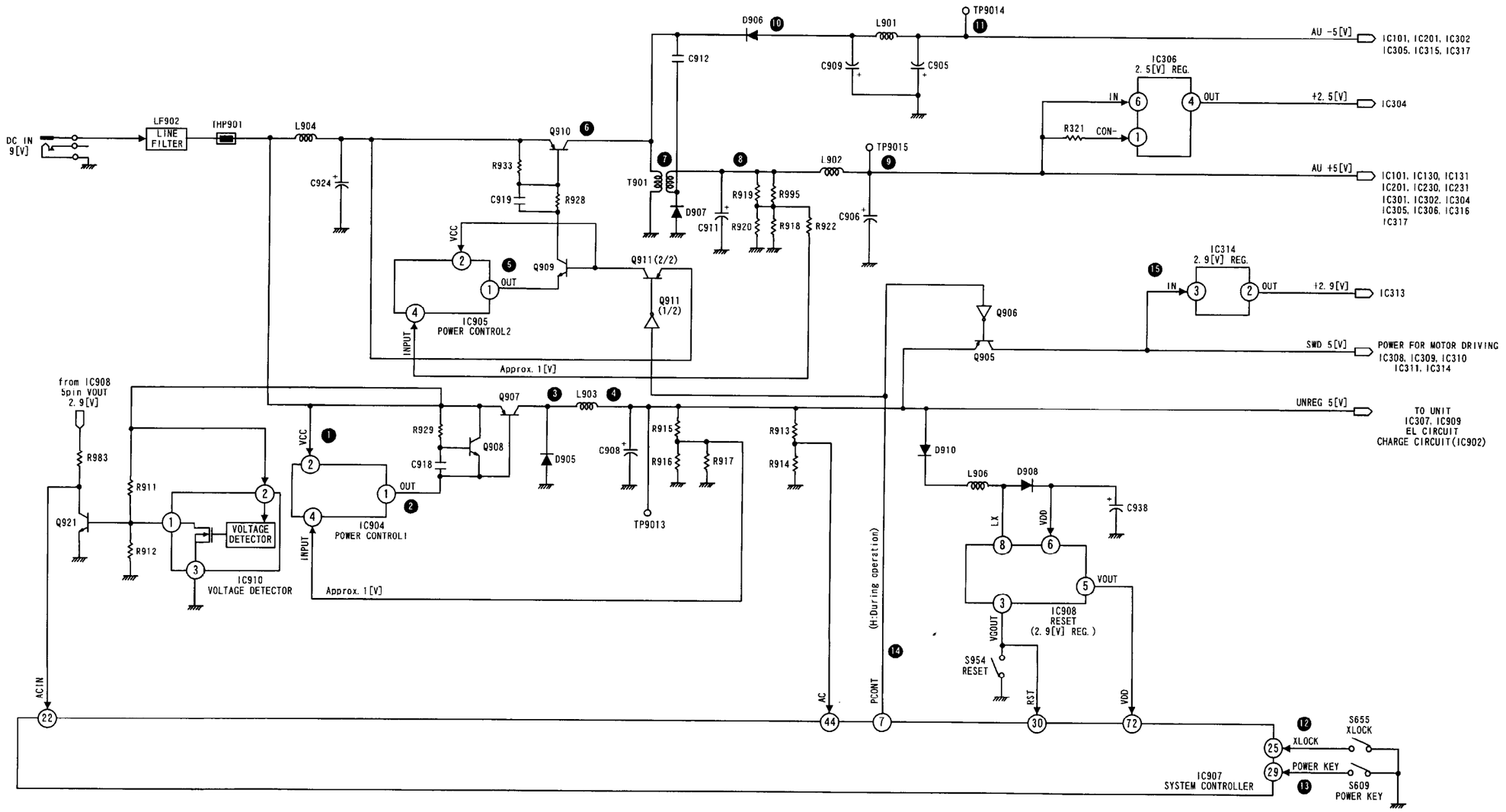


Fig. 3-4 Block diagram of the power supply circuit(MZS-R5ST)

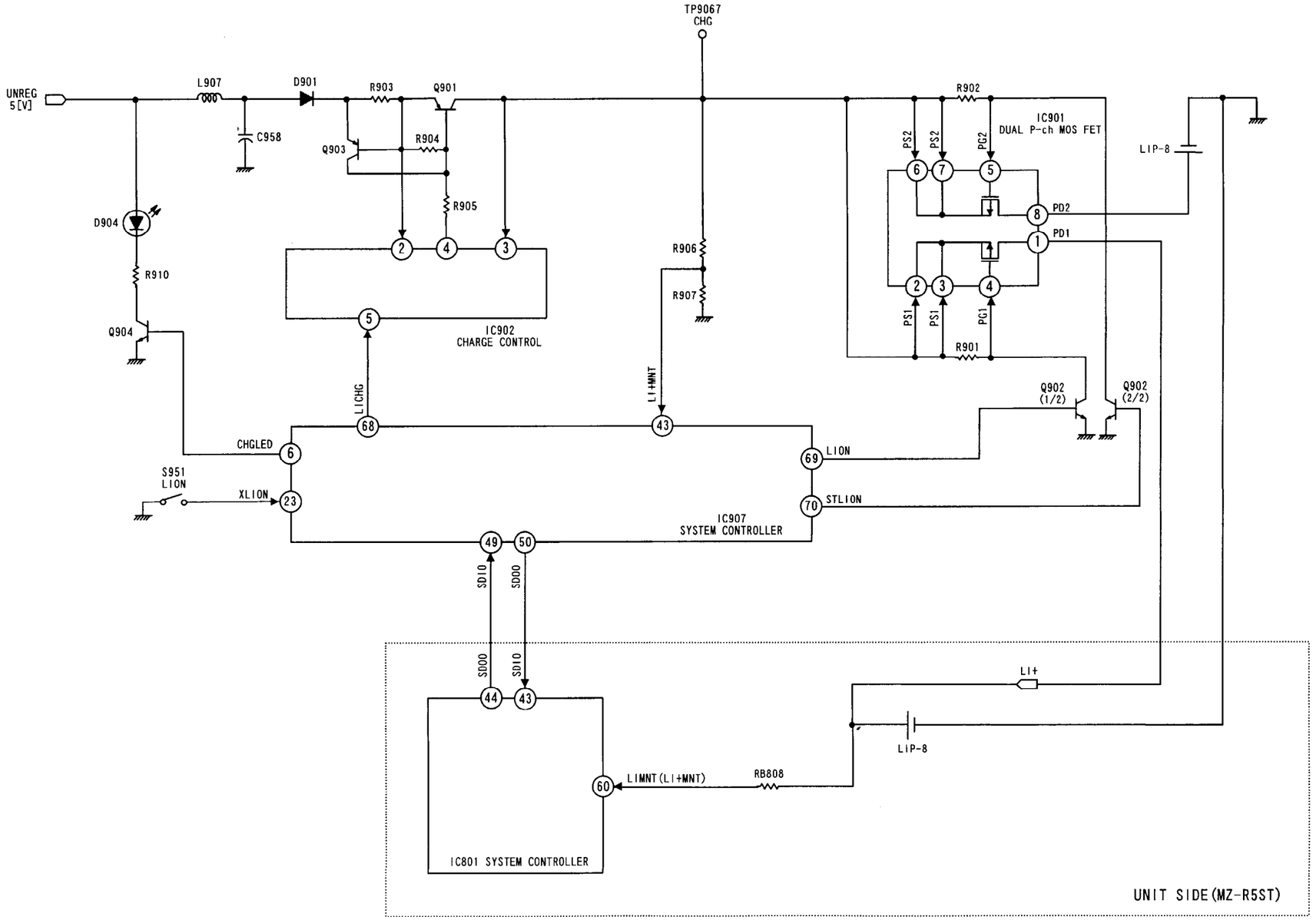


Fig. 3-10 Charging circuit

3-4. Charging Circuit

Fig. 3-10 shows the charging circuit. Charging operation starts when the following conditions are satisfied.

- ◆ When MiniDisc recorder is not connected to station : The main power is supplied to station and lithium-ion battery is connected.
- ◆ When MiniDisc recorder is connected to station : The main power is supplied to station and lithium-ion battery is connected either to MiniDisc recorder to station.

The charging operation when MiniDisc recorder is connected to station, is described first. When the main power is supplied to the station that is connected to the MiniDisc recorder, the respective system controller ICs of MiniDisc recorder and of station are activated. Then the system controller ICs of MiniDisc recorder and of station check presence and absence of rechargeable lithium-ion battery as shown in Table 3-1. Result of this check is sent from the system controller IC801 of MiniDisc recorder to that IC907 of station with the serial command. (This communication can be checked using the service mode installed this unit. Refer to service manual for more details.)

Table 3-1 Presence or absence of lithium-ion battery

	IC801 pin⑥⓪ [LIMNT (LI+MNT)]	IC907 pin㉓ [XLION]
MiniDisc recorder	H	–
Station side	–	L

When the system controller IC907 detects that a lithium-ion battery is connected to either station or MiniDisc recorder, IC907 sets either pin⑥⑨ [LION] or pin⑦⓪ [STLION] whichever a battery is connected, to "H". The P-channel MOS FET inside IC901 is turned "ON" by this "H" signal. Next, the system controller IC907 outputs "L" from its pin⑥⑧ [LICHG]. CHANGE CONTROL IC902 is started up by this "L" signal. When IC902 is started up, IC902 outputs "L" (approximately 3.6 V) from pin④. Q903 and Q901 are turned "ON" by this "L" signal to start charging operation with constant current and constant voltage. The "LI+ voltage" that is output from Q901, is input to the dual P-channel MOS FET IC901 to supply the "LI+ voltage" (approximately 4.2 V) to the respective rechargeable lithium-ion batteries via P-channel MOS FET inside IC901.

Table 3-2 Supply of the "LI+ voltage"

Presence or absence of rechargeable lithium-ion battery	**IC907 pin⑥⑨ [LION]**	**IC907 pin⑦⓪ [STLION]**
MiniDisc recorder (MZ-R5ST) : Presence	H	–
MiniDisc recorder (MZ-R5ST) : Absence	L	–
Station side (MZS-R5ST) : Presence	–	H
Station side (MZS-R5ST) : Absence	–	L

IC902 detects the charging voltage (4.2 V) at its pin③. IC902 controls the output voltage from its pin④ using this feedback voltage.

The system controller IC907 outputs "H" from pin⑥ [CHGLED] while charging the rechargeable lithium-ion battery connected to station. D904 is illuminated by this "H" signal.

3-5. System Backup Circuit

Fig. 3-11 shows the system backup circuit. Station (MZ-R5ST) adapted the built-in rechargeable Ni-Cd battery as shown in Fig. 3-11.

1. Charging circuit

When DC plug is connected to DC jack, the UNREG +5 V is generated and is sent to the 3.3 V regulator IC906 pin③ [IN]. When the 3.3 V regulator IC906 is started up, 3.3 V is generated by the series regulator inside IC906 and is output from pin② [OUT]. The 3.3 V is supplied to rechargeable Ni-Cd battery as the charging voltage. It takes about 10 hours to fully charge a battery. This battery operates about one week as the power supply for TOC writing during timer recording even though AC power is kept disconnected.

2. Operation when system backup works

When DC plug is disconnected from DC jack, the P-channel MOS FET Q924 is turned on, and the output voltage from the rechargeable backup battery is supplied to the RESET IC908 pin⑥ [VDD] via Q924. The RESET IC908 has the VDD power supply voltage detection circuit, and the IC908 controls the self-step-up circuit consisting of L906, D908, C938 and the switching output of pin⑧ [LX] to maintain the VDD input voltage always above 3.4 [V]. When IC908 is started up, the MICON +B voltage 2.9 V is generated by the step-up/step-down regulator inside IC908. IC908 then outputs the generated 2.9 V from pin⑤ [VOUT] to the system controller IC907 pin⑫ [VDD].
When the generated 2.9 V is supplied, the system controller IC907 keeps activated until the backup battery runs out even though DC IN 9V is not supplied. The output voltage of the rechargeable backup battery is supplied to MiniDisc recorder via D903 too. Then the system controller IC801 of MiniDisc recorder also starts up in the same manner as station. (Refer to section "5. MZ-R5ST MiniDisc RECORDER POWER SUPPLY CIRCUIT THEORY" for more details.) During the system backup mode, the system controller IC801 and REAL TIME CLOCK IC804 of MiniDisc recorder and the system controller IC907 of station are activated. The following data is kept memorized by the communication between the two system controller ICs.

- VOLUME setting data
- Clock setting data
- RESUME data, etc.

3. RESET operation

The RESET switch S954 is installed that allows manual reset because the system controller IC907 keeps activated until the backup battery runs out if it is started once. This RESET switch can be used to exit the service mode and for other purposes.

4. Power supply detection

Whether DC IN 9V is supplied or not is detected by pin㉒ [ACIN] of IC907 because the system controller IC907 keeps activated until the backup battery runs out if it is started once. ("L": when DC IN 9V is supplied.) When DC IN 9V is supplied and pin㉒ [ACIN] of system controller IC907 goes to "L" while the system backup power is also supplied, the status signal telling that DC IN 9V is supplied, is output from pin㊿ [SD00] of IC907 to the system controller IC801 of MiniDisc recorder in the form of serial data. When IC801 receives the serial data, the reset operation is performed in the MiniDisc recorder.

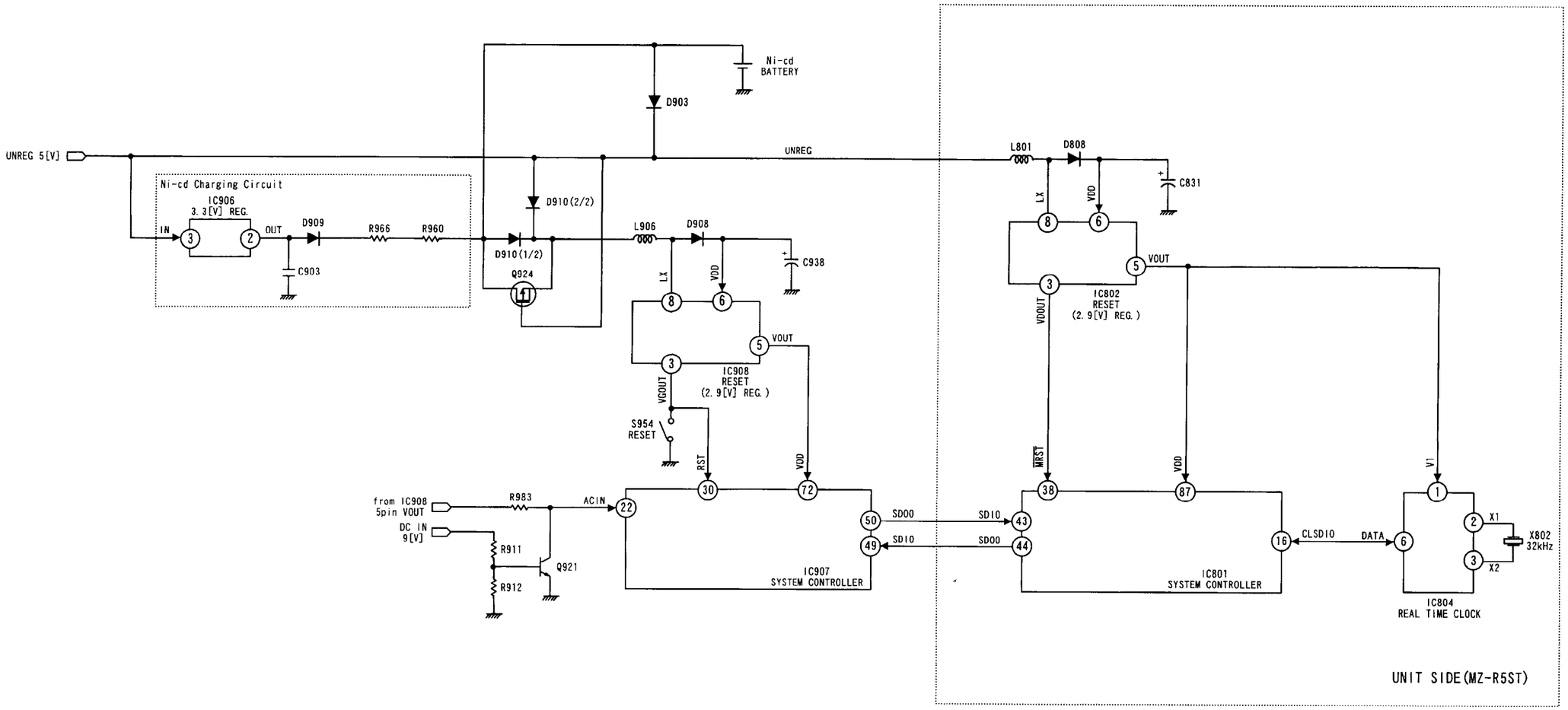


Fig. 3-11 System backup circuit

3-6. Key Input and Switch Detection

Fig. 3-12 shows block diagram of the key input and switch detection circuit of station. The system controller IC907 detects that any of the key switches is pressed, by performing detection shown in Table 3-3 through Table 3-8. Result of detection of the keys and switches that are shaded in these tables can also be checked when the service mode is used. Refer to service manual for more details.

Table 3-3 Detection switches

Switch No.	Switch Name	System control IC detect pin	Contents of Detection
S630	PANEL DOWN	Pin⑬ [PANEL DOWN]	Detect whether panel of LCD is closed or not. ("L": During PANEL DOWN)
S609	POWER	Pin㉙ [POWER KEY]	POWER key detection switch
S610	PLAY KEY	Pin㉖ [PLAY KEY]	PLAY key detection switch
S611	REC KEY	Pin㉗ [REC KEY]	REC key detection switch
S612	LINE-OPT1-OPT2	Pin㉞ [LINEOPT1] Pin㉟ [LINOPT2]	Input sound source selector switch
S613	PLAY-OFF-REC	Pin㊹[TIMER1] Pin㊺ [TIMER2]	Timer setting detection switch
S614	SYNCREC	Pin㊻[SYNCREC]	Synchro recording detection switch ("L": When selecting synchro recording)
S951	XLION	Pin㉓ [XLION]	Presence or absence of lithium battery of station ("L": Presence)
S953	RELEASE	Pin㉔[XRELEASE]	RELEASE key detection switch
S952	CLOCK SET	Pin㉘[CLOCK KEY]	CLOCK SET key detection switch
S655	XLOCK	Pin㉕[XLOCK]	Whether MiniDisc recorder is fixed to station or not . ("L": When MZ-R5ST is connected to station (MZS-R5ST))
S656	XINT	Pin㊶[XINIT]	Detect the initial position of MiniDisc. ("H": When MZ-R5ST is connected to station (MZS-R5ST))

Table 3-4 List of KEY0 input voltage

Switch No.	Switch Name	13 IC907 pin㊳[KEYO]
S604	STOP	0 [V]
S605	REW	0.4 [V]
S606	FF	0.8 [V]
S607	PAUSE	1.2 [V]
S608	END.S	1.7 [V]

Table 3-5 List of KEY1 input voltage

Switch No.	Switch Name	IC907 pin㊴[KEY1]
S618	DISPLAY	0 [V]
S619	MODE	0.4 [V]
S620	UNDO	0.8 [V]
S621	TRACK MARK	1.2 [V]
S622	MOVE	1.7 [V]
S623	ERASE	2.1 [V]

Table 3-6 List of KEY2 input voltage

Switch No.	Switch Name	C907 pin㊵[KEY2]
S624	TITLE/ENTER	0 [V]
S625	SELECT	0.4 [V]
S626	CS+	0.8 [V]
S627	CS–	1.2 [V]
S628	UP	1.7 [V]
S629	DOWN	2.1 [V]

Table 3-7 List of KEY3 input voltage

Switch No.	Switch Name	IC907 pin㊶[KEY3]
S601	TREC	0 [V]
S602	VOL+	0.4 [V]
S603	VOL–	0.8 [V]

Table 3-8 List of KEY4 input voltage

Switch No.	Switch Name	IC907 pin㊷[KEY4]
S615	CAPS	0 [V]
S616	RIGHT	0.4 [V]
S617	LEFT	0.8 [V]

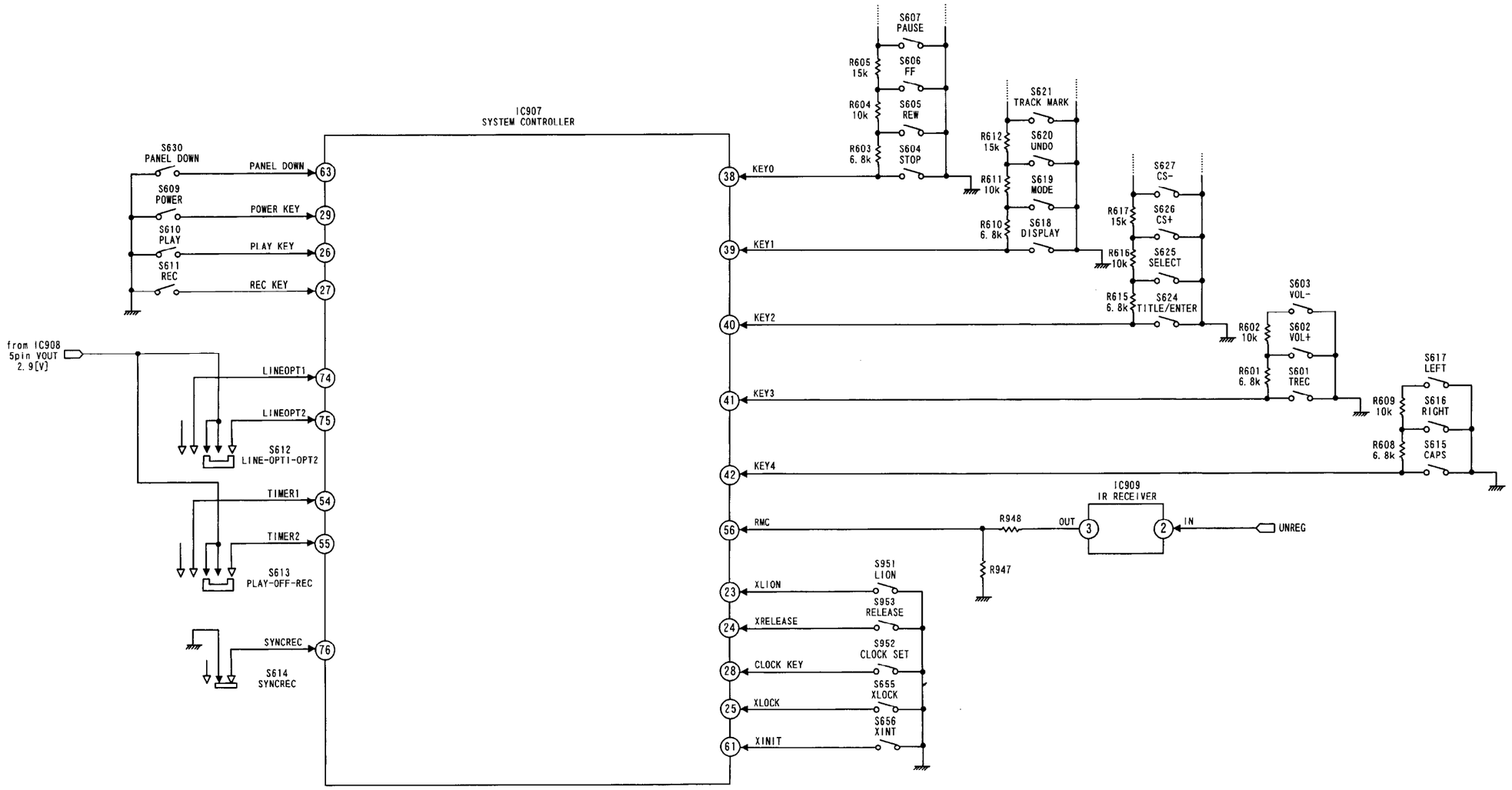
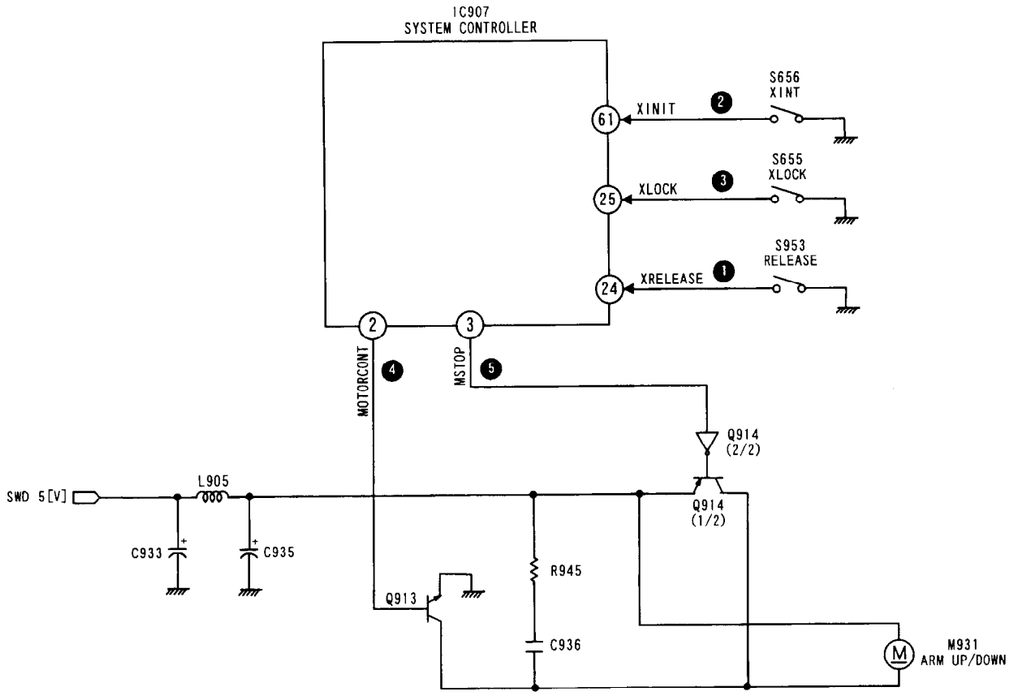
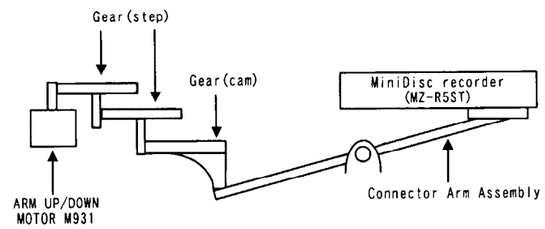
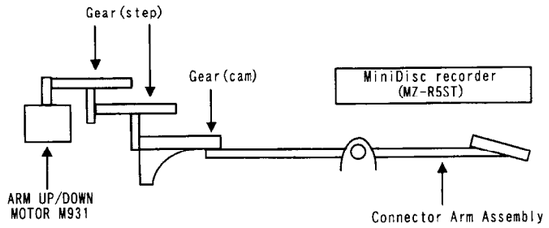


Fig. 3-12 Block diagram of the key input and switch detection circuit (MZS-R5ST)

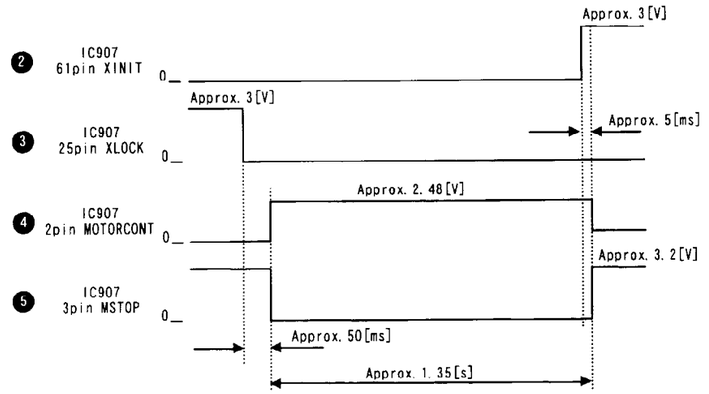




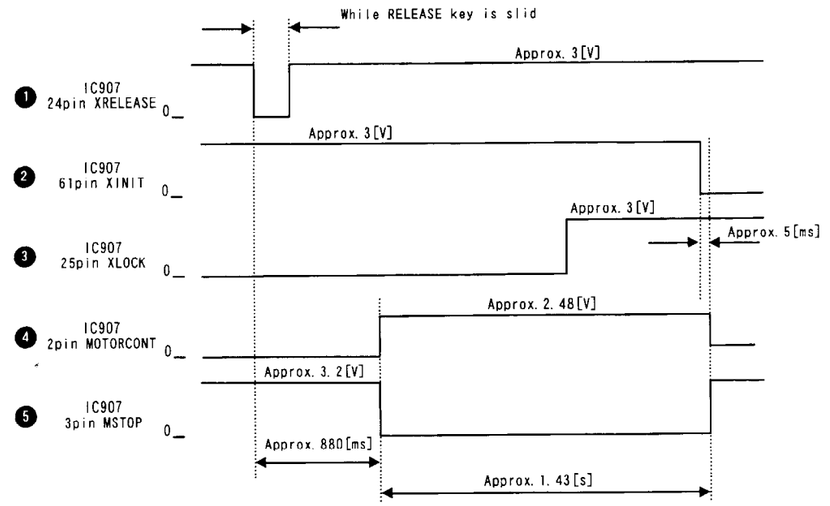
(a) Operation of mechanism when MiniDisc recorder is connected



(b) Operation of mechanism when MiniDisc recorder is removed



(c) When MiniDisc recorder is connected



(d) When MiniDisc recorder is removed

Fig. 3-13 Block diagrma of the MiniDisc recorder connection and removal

3-7. MiniDisc Recorder Connection and Removal

Fig. 3-13 shows the connection and removal circuit of MiniDisc recorder.

(1) Operation when MiniDisc recorder is connected to station

When MiniDisc recorder is connected to station, "L" single is input to pin㉕ [XLOCK] of system controller IC907. When IC907 detects that "L" signal is input to Pin㉕ [XLOCK], it outputs "H" from pin② [MOTORCONT] and "L" from pin③ [MSTOP]. These output signals turn on Q913 and turn off Q914 (1/2) to start rotation of the arm up/down motor M931. As the arm up/down motor M931 rotates, the gear (step) and gear (cam) are driven by this motor rotation. The gear (cam) has protrusion. When MiniDisc recorder is connected to station, this gear (cam) overrides the connector arm assembly. (Refer to (a) in Fig. 3-13.) As the connector arm assembly overrides, the connector arm assembly moves upwards so that MiniDisc recorder is connected to station. At this state, XINT SW656 is set to the "un-pressed" state so that input to pin㊶ [XINIT] of the system controller IC907 goes to "H". As the system controller IC907 detects that input to pin㊶ [XINIT] goes to "H", it outputs "L" from pin② [MOTORCONT] and "H" from pin③ [MSTOP] so that rotation of the arm up/down motor M931 is stopped.
Fig. 3-13 (c) shows the timing when MiniDisc recorder is connected to station.

(2) Operation when MiniDisc recorder is removed from station

When the RELEASE key is slid to right direction, input to pin㉔ [XRELEASE] of the system controller IC907 goes to "L". When the "L" is input to pin㉔ [XRELEASE], it outputs "H" from pin② [MOTORCONT] and "L" from pin③ [MSTOP]. These output signals turn on Q913 and turn off Q914 (1/2) to start rotation of the arm up/down motor M931. As the arm up/down motor M931 rotates, the gear (step) and gear (cam) are driven by this motor rotation. The gear (cam) has protrusion. When MiniDisc recorder is removed from station, this gear (cam) removes the connector arm assembly. (Refer to (b) in Fig. 3-13.) As the connector arm assembly is removed, the connector arm assembly moves downwards so that MiniDisc recorder is disconnected from station. At this state, XINT SW656 is set to the "pressed" state so that input to pin㊶ [XINIT] of the system controller IC907 goes to "L". As the system controller IC907 detects that input to pin㊶ [XINIT] goes to "L", it outputs "L" from pin② [MOTORCONT] and "H" from pin③ [MSTOP] so that rotation of the arm up/down motor M931 is stopped.
Fig. 3-13 (d) shows the timing when MiniDisc recorder is removed from station.

3-8. Mute Circuit

Fig. 3-14 shows block diagram of the mute circuit (MZS-R5ST). The mute circuit is activated when any of the following three conditions is satisfied.

■ Conditions

① When any key such as STOP/ PAUSE / FF is operated (Mute control by pin㊽[AMUTE] of the system controller IC801 of MiniDisc recorder)

② When MiniDisc recorder is removed and when station is used as a stand-alone unit (Mute control by pin㊼ [PMUTE] of the system controller IC907 of station)

③ When DC plug is removed from station (Mute control by the voltage detector IC316)

The mute circuit operation under the respective conditions is described respectively. Because the L-channel and the R-channel use the same circuit configuration, only the flow of L-channel signal is described below.

(1) Mute circuit operation under the above described condition ①

When MiniDisc recorder is connected to station, and when any function button such as STOP or FF button requiring the mute operation, is pressed, "H" is output from pin㊽ [AMUTE] of the system controller IC801. Q301 and Q302 are turned "ON" by this "H" signal, and AUDIO +5 V is supplied to Q101 to Q103 so that the respective output signals are muted.

(2) Mute circuit operation under the above described condition ②

When MiniDisc recorder is removed or when station is used as a stand-alone unit, "H" is output from pin㊼ [PMUTE] of the system controller IC907. The mute circuit functions in the same way as described in the above condition ①. Also as Q304 and Q303 are turned "ON" by this "H" signal, AUDIO +5 V is supplied to Q104. And the input side of the headphones amplifier IC305 is muted too.

(3) Mute circuit operation under the above described condition ③

When DC plug is removed from station, input to pin③ of the voltage detector IC316 goes to "L". IC316 has the built-in power supply voltage detection circuit so that it outputs "H" when the input to its pin③ becomes lower than 4.5 V. This "H" signal turns on the next stage N-channel MOS FET so that the pin① potential goes to "L" which turns on Q302 to activate the mute circuit.

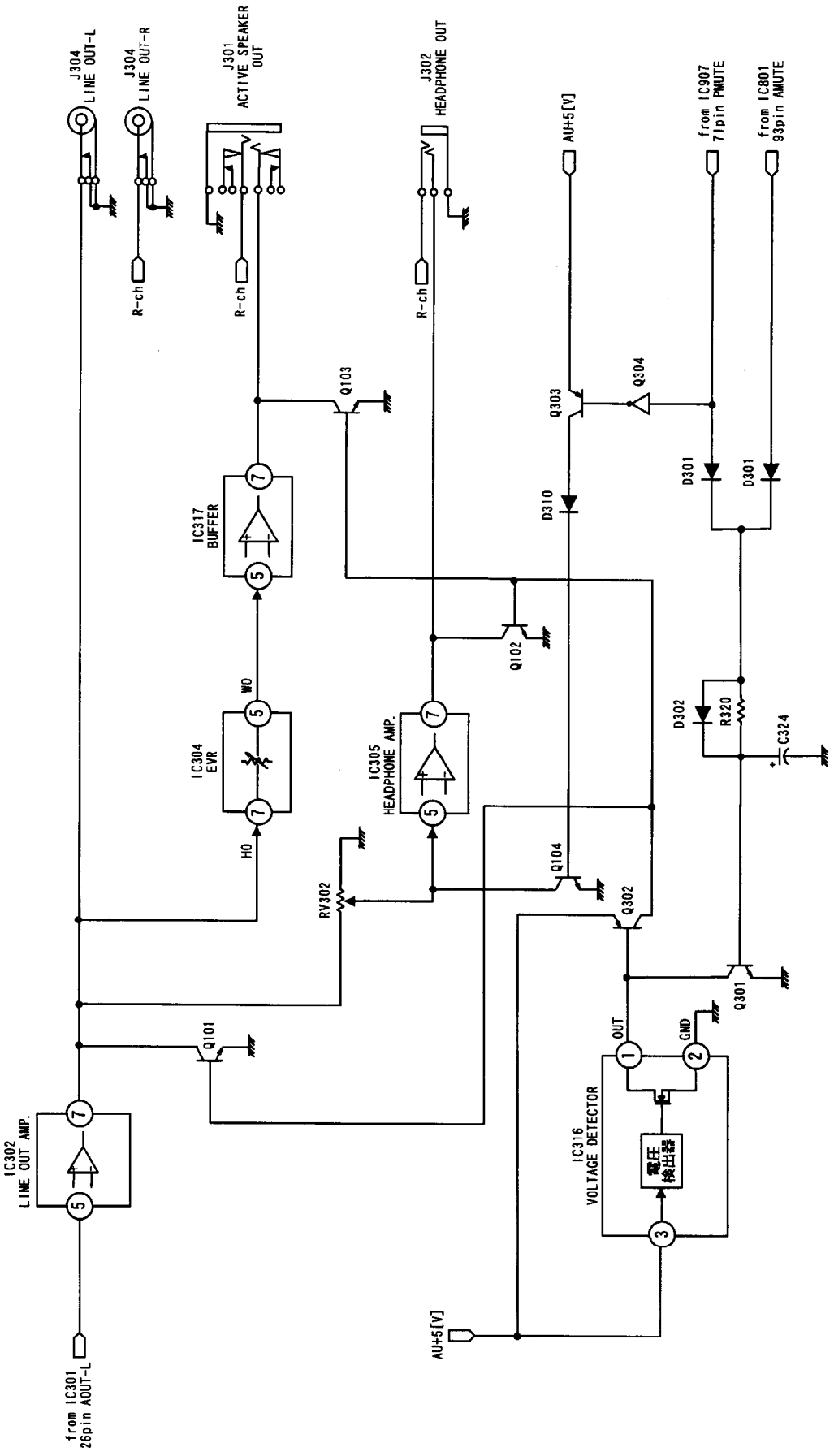


Fig. 3-14 Block diagram of the MUTE circuit (MZS-R5ST)

3-9. LCD Backlight Illuminating Circuit

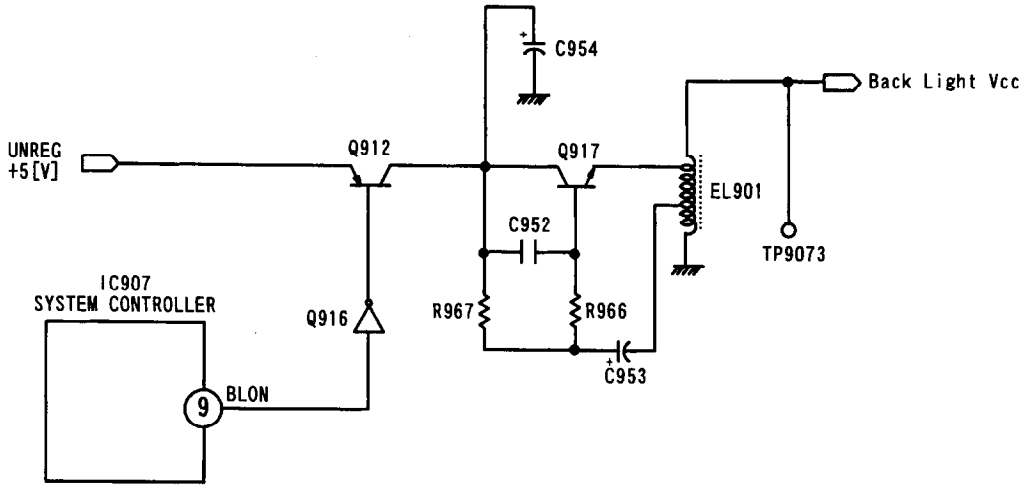


Fig. 3-15 Block diagram of the LCD backlight illuminating circuit

Fig. 3-15 shows the block diagram of the LCD backlight illuminating circuit. When the LCD backlight is turned on, "H" is output from the system controller IC907 pin⑨ [BLON]. This "H" signal turns on Q916, Q912 and Q917 so that the UNREG +5 V is supplied to EL901. Then high frequency signal is generated by the transformer EL901 and supplied to the EL element of the LCD block so that the EL element illuminates.

Oscillating waveform during normal operation is shown in Fig. 3-16.

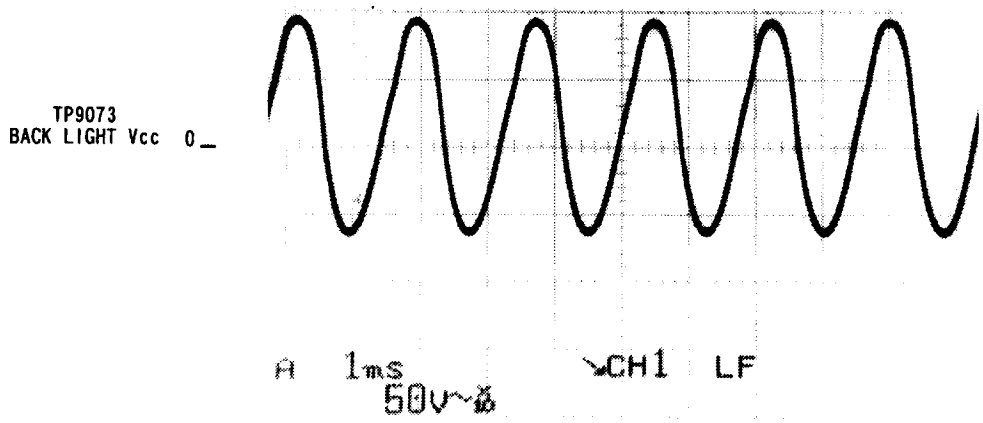


Fig. 3-16 Oscillating waveform during normal operation

3-10. Clock Adjustment

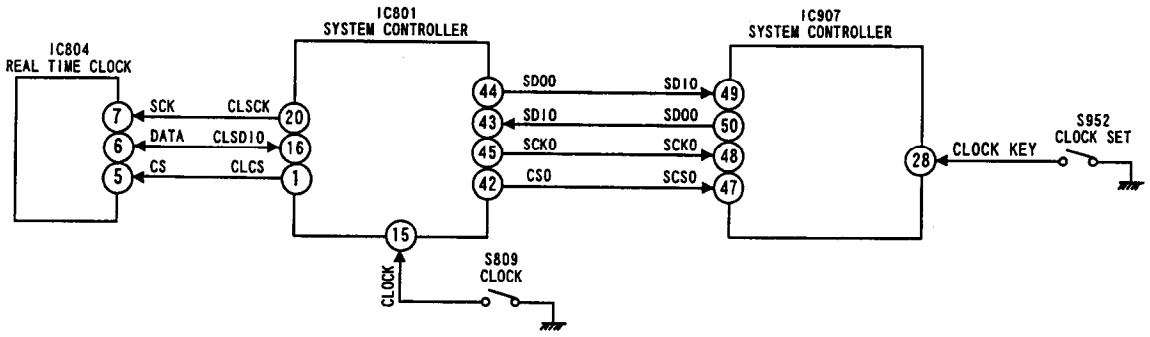


Fig. 3-17 Block diagram of clock adjustment

Fig. 3-17 shows block diagram of clock adjustment.

(1) Operation when MiniDisc recorder is connected to station

When the CLOCK SET switch S952 is pressed, input to the system controller IC907 pin㉘ [CLOCK KEY] goes to "L". IC907 detects that the CLOCK SET switch is pressed and at the same time establishes communication with the system controller IC801 of MiniDisc recorder so that the clock setting data is output to IC801. When IC801 receives the clock setting data, it sends the clock setting data from pin⑯ [CLSDIO] to the real time clock IC804 in synchronization with the clock at pin⑳ [CLSCK] and the chip select signal at pin① [CLCS]. Thus clock adjustment is performed.

(2) Operation when MiniDisc recorder is used as a stand-alone unit

When the CLOCK switch S908 is pressed, input to the system controller IC801 pin⑮ [CLOCK] of MiniDisc recorder goes to "L". IC801 detects that the CLOCK switch is pressed and at the same time it sends the clock setting data from pin⑯ [CLSDIO] to the real time clock IC804 in synchronization with the clock at pin⑳ [CLSCK] and the chip select signal at pin① [CLCS]. Thus clock adjustment is performed.

(3) Operation after time is set

When MiniDisc recorder is started its operation, the system controller IC801 output the read-out command from pin⑯ [CLSDIO] to the real time clock IC804 in synchronization with the clock at pin⑳ [CLSCK] and the chip select signal at pin① [CLCS]. When the real time clock IC804 receives the read-out command, it sends the clock data to the system controller IC801 in synchronization with the clock at pin⑳ [CLSCK] and the chip select signal at pin① [CLCS] in the same manner as the data write mode. When the system controller IC801 receives the time information, it sends the time information to the system controller IC907 in synchronization with the clock that is output from pin㊺ [SCK0]. Thus the respective ICs receive the time information.

4. SIGNAL CIRCUIT

The signal circuit of this unit is almost same as that of the 4th generation MiniDisc recorder MZ-R30. Therefore, only the following items are described in this manual.

- Recording circuit → The signal path up to the input stage of the DSP IC503 is described.
- Playback circuit → The signal (DA data) path after the playback signal is output from the DSP IC503 is described.

Refer to "NEW TECHNICAL THEORY FOR SERVICING, MZ-R30, OPERATION MANUAL (9-923-089-31)" for the description of the signal processing of DSP IC503 and for the description of servo circuit.

4-1. Recording Circuit

1. Operation (of DIGITAL IN/OUT circuit) during digital recording

Fig. 4-1 shows block diagram of the DIGITAL IN/OUT circuit.

(1) Selection of recording source

This unit has the two digital inputs. The recording source selector switch S612 is installed in station. Selection information of this switch is sent to the system controller IC907 pin⑭ [LINEOPT1] and pin⑮ [LINEOPT2]. The system controller IC907 identifies the recording source by recognizing the input as shown in Table. 4-1.

Table 4-1 Recording source selector switch S612

Recording source selector switch S612	IC907 pin⑭[LINEOPT1]	IC9O7 pin⑮ [LINEOPT2]	IC907 pin⑪[OPT]
Line	L	L	L
OPT1	H	L	H
OPT2	L	H	L

(2) DIN SELECTOR IC311

During digital recording, the respective digital data of each input source is input to the DIN SELECTOR IC311 pin⑬ [4B] and pin⑭ [4A]. Then the system controller IC907 outputs the control signal ("H": when DIN1 is selected) from pin⑪ [OPT], based on the result of selection of the recording source selector switch S612. The output signal from IC907 pin㊻ [BUF EN] is the start-up switch signal ("L": during starting up IC307) of the level converter 3 V to 5 V IC307.

(3) Level converter 5 V to 3 V IC313

The digital input data selected by the DIN selector IC311 is sent to the level converter 5 V to 3 V IC313. IC313 has the function to convert the signal having 5 V amplitude is converted to the signal having 3 V amplitude (exactly speaking 2.9 V amplitude) because the DSP IC503 of MiniDisc recording operates on 2.8 V. After the signal level conversion, IC313 outputs the digital data from pin③ [1Y] to the DSP IC503 pin㉑ [DIN] of MiniDisc recorder where signal processing for recording is performed. The output signal from the system controller IC907 pin⑩ [OPT EN] is the start-up switch signal of the level converter inside the level converter 5 V to 3 V IC313. "L" is output from the system controller IC907 pin⑩ [OPT EN] when the following conditions are satisfied.

◆ Conditions : When result of selection of the recording source selector switch S612 is either OPT1 or OPT2, and when mode of MiniDisc recorder is either REC or REC PAUSE.

(4) Operation of the digital output circuit

Firstly, the digital data that is bi-phase mark modulated inside the DSP IC503, is output from pin㉒ [DOUT] to the level converter of 3 V to 5 V IC307. IC307 converts the input signal having 2.8 V amplitude to the signal having 5 V amplitude that is output from pin⑥ [A5] to the DOUT terminal.

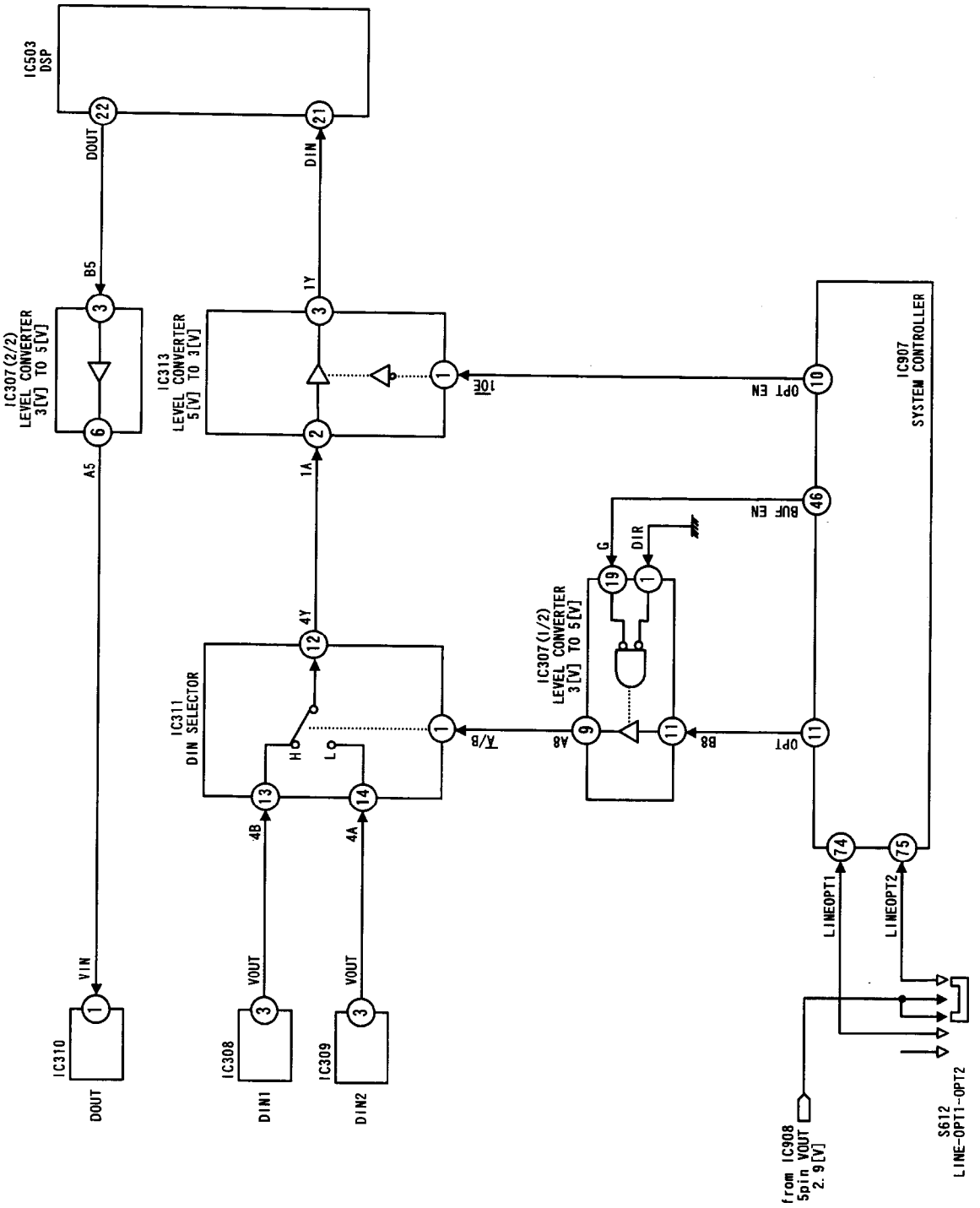


Fig. 4-1 Block diagram of the DIGITAL IN/OUT circuit

2. Operation during LINE recording

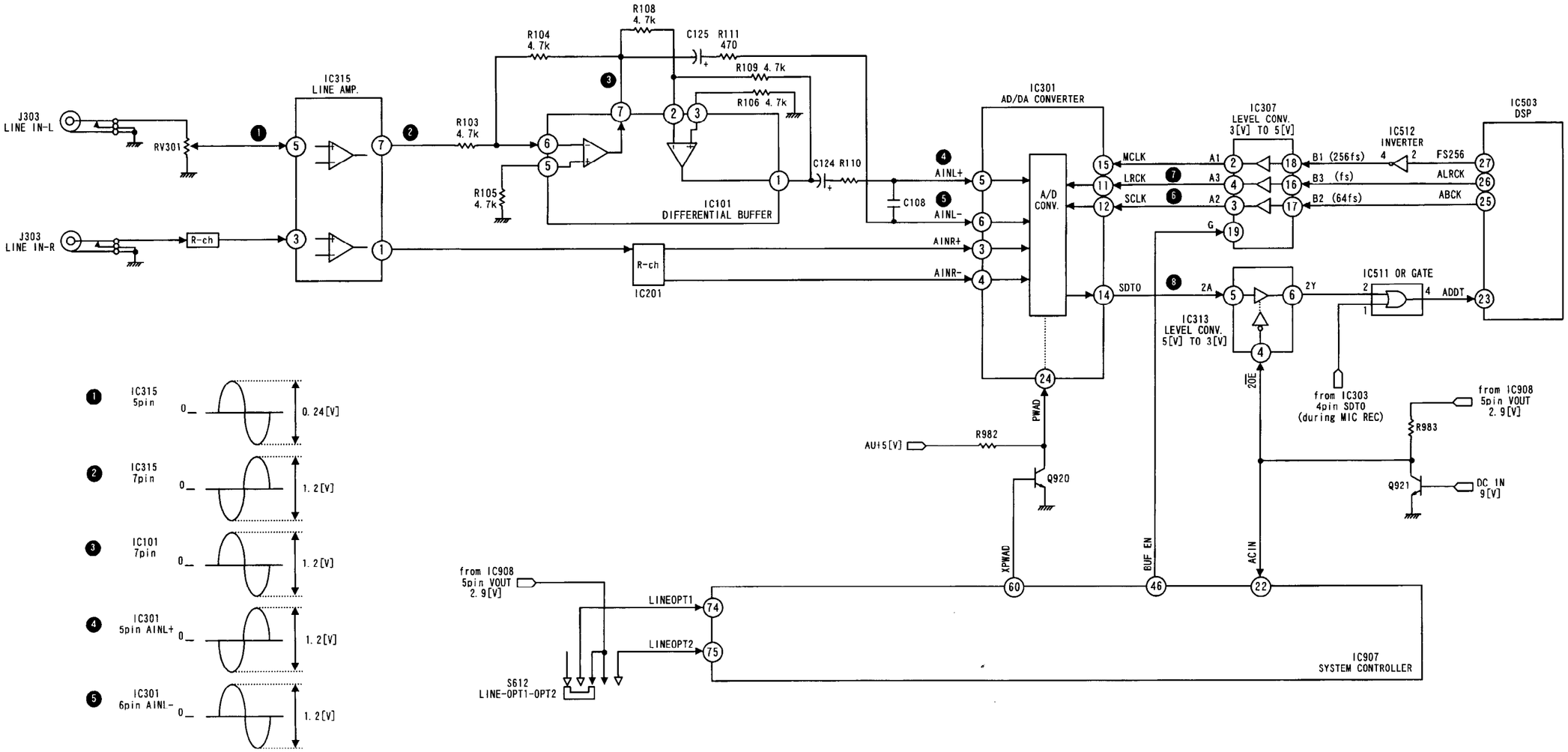
Fig. 4-2 shows block diagram of the recording circuit during LINE recording. Because the L-channel and the R-channel use the same circuit configuration, only the L-channel is described below. This unit is equipped with the differential conversion circuit at the LINE input in order to realize the same high quality sound as that of deck-type MiniDisc recorder. The differential conversion circuit improves the resolution ability when signal is A/D converted inside the AD/DA converter IC301.

When LINE is selected by the input source selector switch S612, input of the system controller IC907 pin⑭ [LINEOPT1] and pin⑮ [LINEOPT2] go to "L", and IC907 recognizes that the input source is analog (LINE). When MiniDisc recorder enter the REC mode or the REC PAUSE mode, IC907 output "L" signal from pin⑩ [XPWAD]. Q920 is turned "OFF" by this "L" signal so that "H" is input to the AD/DA converter IC301 pin㉔ [PWAD] so that the A/D converter inside IC301 is started up.

The L-channel signal flow during the LINE recording is described next. The L-channel analog signal that is input from the LINE IN jack J303 passes through the LINE amplifier IC315, the differential buffer IC101 and is sent to the AD/DA converter IC301 pin⑤ [AINL+] and pin⑥ [AINL–], then to the A/D converter inside IC301 where the input analog signal is converted to the 20-bit digital data. The generated digital data is output to the DSP IC503 alternately via the level converter IC313 and OR gate IC511 in synchronization with the LRCK (L-channel/R-channel discrimination signal) and BCK (bit clock).
The level converter IC313 has the function to convert the signal having 5 V amplitude is converted to the signal having 3 V amplitude (exactly speaking 2.9 V amplitude) because the DSP IC503 of MiniDisc recording operates on 2.8 V. During LINE recording, Q921 is turned on by the DC IN 9 V that is supplied to station so that the input to IC313 pin④ [2$\overline{OE}$] is set to "L". This "L" signal activates the level converter circuit inside IC313.

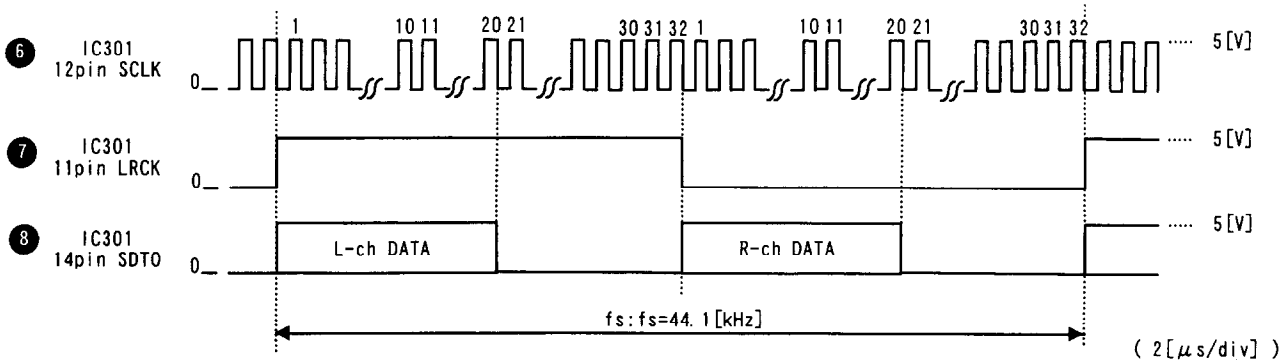
Fig. 4-2 (a) shows the waveform timing chart when the following conditions are satisfied. Fig. 4-3 shows the waveform timing of IC301 output side.

- ◆ Input sound source : 1 kHz, 0 dB signal
- ◆ Recording level : Adjusted around –2 dB by the REC volume.

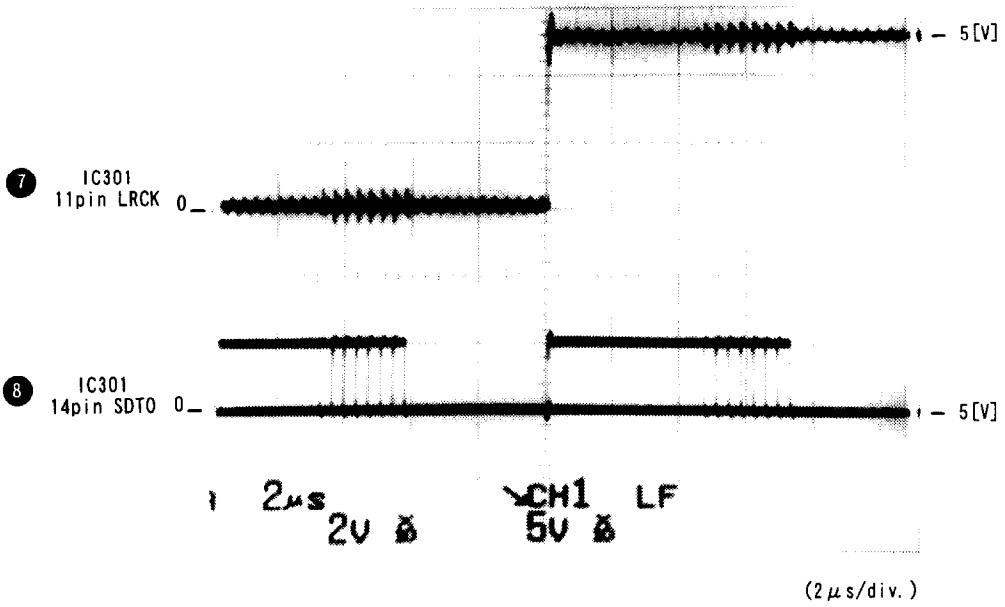


(a) Waveform timing chart when input signal is 1kHz, 0dB

Fig. 4-2 Block diagram of the recording circuit during LINE recording



(a) Waveform timing of IC301 output side



(b) Waveform timing example of IC301 output side

Fig. 4-3 Waveform timing of IC301 output side

3. Operation during MIC recording

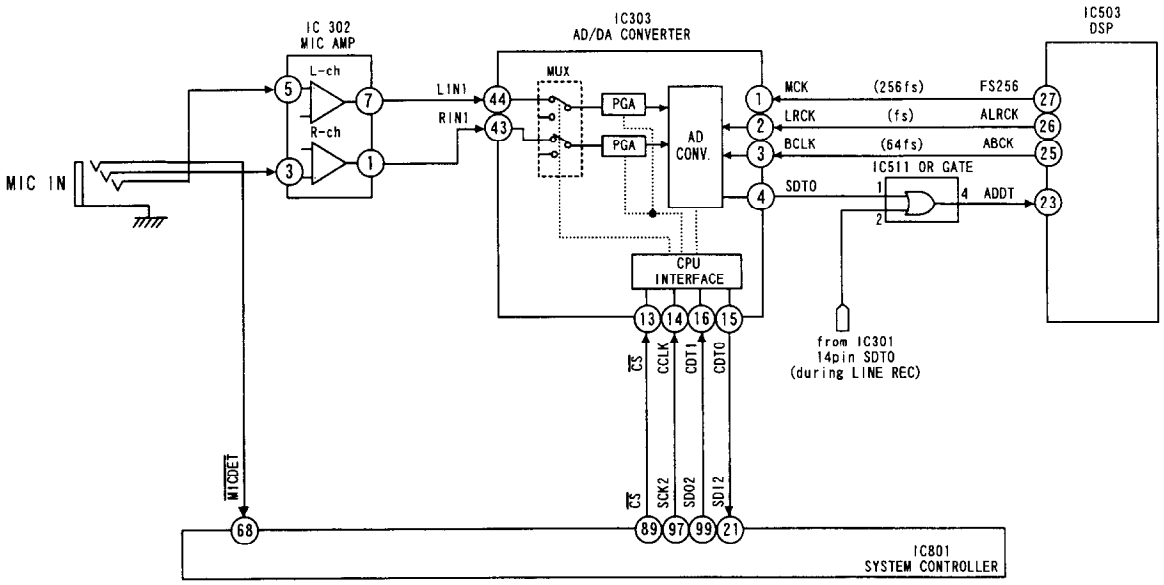


Fig. 4-4 Block diagram of the recording circuit during MIC recording

Fig. 4-4 shows the block diagram of the recording circuit during MIC recording.

The analog signal that is input from the MIC IN jack is amplified by the microphone amplifier IC302 and input to the AD/DA converter IC303 pin㊹ [LIN1] and pin㊸ [RIN1]. The input analog signal is amplified by PGA (Programmable Gain Amplifier) inside IC303, then input to A/D converter in IC303 where the input analog signal is converted to the 16-bit digital data. The generated digital data is output to the DSP IC503 alternately in synchronization with the LRCK (L-channel/R-channel discrimination signal) and BCK (bit clock).
In the AD/DA converter IC303, the internal multiplexer receives the serial command (input source selection command and others) from the system controller IC801 pin㊾ [SD02] and selects the input source. Because MiniDisc recorder uses the A/D converter inside the AD/DA converter IC303 only during MIC recording, IN1 is always selected as the input source. The AD/DA converter IC303 has the built-in PGA (Programmable Gain Amplifier) which is used to enable either AUTO gain mode recording or MANUAL gain mode recording during MIC recording. PGA adjusts the MIC gain by means of software during the AUTO mode, and adjusts the MIC gain in accordance with the value set by user during the MANUAL mode.

The MIC recording is possible when MiniDisc recorder is operated without station. When MiniDisc recorder is connected to station (MZS-R5ST), the MIC recording is not possible.

4-2. Playback Circuit

(1) Basic configuration of playback circuit

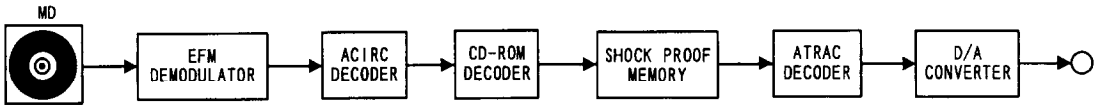


Fig. 4-5 Playback circuit basic block diagram

Fig. 4-5 shows the playback circuit basic block diagram of MiniDisc system. The RF data that is read by the optical block is EFM-demodulated by the EFM demodulator, and is performed the error detection and error correction by the ACIRC decoder. Because the MiniDisc data has the same data structure as that of CD-ROM format, the RF signal is decoded by the CD-ROM decoder. Then the ATRAC data that is obtained by decoding has already compressed into 1/5 of original data, and is stored once in the shock proof memory (buffer RAM). This memory stores not only the ATRAC data but also the error information (C2PO) and TOC/UTOC information too. Next, the ATRAC data that is periodically read out from the shock proof memory, is expanded to the 16-bit or 20-bit linear data by the next stage ATRAC decoder. The ATRAC data is then converted to analog signal by the next stage D/A converter.

(2) Playback circuit

Fig. 4-6 shows block diagram of the playback circuit, when MiniDisc recorder is connected to station. The DA data that is output from the DSP IC503 of MiniDisc recorder is sent to the AD/DA converter IC301 via the level converter 3 V to 5 V IC 307. The DA data is converted to the L-channel and R-channel analog signal by D/A converter located inside IC301. The output analog signal is sent to the LINE OUT jack J304 via the LINE OUT amplifier IC302, and is sent to the HEADPHONES OUT jack J302 via the LINE OUT amplifier IC302, the PB VOLUME RV302 and headphone amplifier IC305. It is also output to the ACTIVE SPEAKER OUT jack J301 via the LINE OUT amplifier IC302, EVR IC304 and buffer IC317.

Regarding the signal output to MiniDisc recorder (MZ-R5ST), signal flow of L-channel signal only is described below. When MiniDisc recorder is connected to station, you can listen to sound from the HEADPHONES output of MiniDisc recorder. The headphone output signal is created as follows. The analog signal that is output from the AD/DA converter IC301 is sent to the audio gain amplifier IC305 via differential amplifier consisting of IC330, IC130 and IC131. After the audio volume is controlled by the audio gain control IC305 and by the communication with the system controller IC801, the audio signal is output from the HEADPHONES OUT jack J302 via the headphone amplifier IC805.

(3) System controller IC907

It controls the output signal during playback as shown in Table 4-2.

Table 4-2 Control signals during playback

	IC907 pin㊻ [BUF EN]	IC907 pin㊽ [XPWDA]	IC907 pin① [DEEMP]	IC907 pin㊽ [DIFO]	IC907 pin㊾ [DIF1]
H	IC307 during STOP	D/A converter during STOP	De-emphasis during OFF	–	When the main power is ON
L	IC 307 during START	D/A converter during START	De-emphasis during ON	Constant "L"	When the main power is OFF

When MiniDisc system is operated, the system controller IC907 outputs "L" from pin⑱ [DIF0] and "H" from pin⑲ [DIF1]. These output signals are the control signal for the audio serial interface format to be used inside the AD/DA converter IC301. When these signals are sent, IC301 selects the operating mode that is specified in accordance with the input signals at pin⑨ [DIF0] and pin⑩ [DIF1]. In this unit, MODE1 is always selected.

Table 4-3 List of audio serial interface mode

MODE	IC301 pin⑨ [DIF0]	IC301 pin⑩ [DIF0]	SDTO (A/D converter)	SDTI (D/A converter)	L/R
0	L	L	20-bit, MSB, justified	16-bit, LSB, justified	H/L
1	H	L	20-bit, MSB, justified	20-bit, LSB, justified	H/L
2	L	H	20-bit, MSB, justified	20-bit, MSB, justified	H/L

When the system controller IC907 detects that the active speaker VOLUME key is pressed at pin㊶ [KEY3], IC907 outputs data from pin⑰ [EDATA] to EVR IC304 in synchronization with the clock at pin⑮ [ESCK] and the chip select signal at pin⑯ [ECS]. Output data from IC907 controls the output signal from ACTIVE SPEAKER OUT J301.

Fig. 4-7 shows the waveform timing chart of IC301 input side.

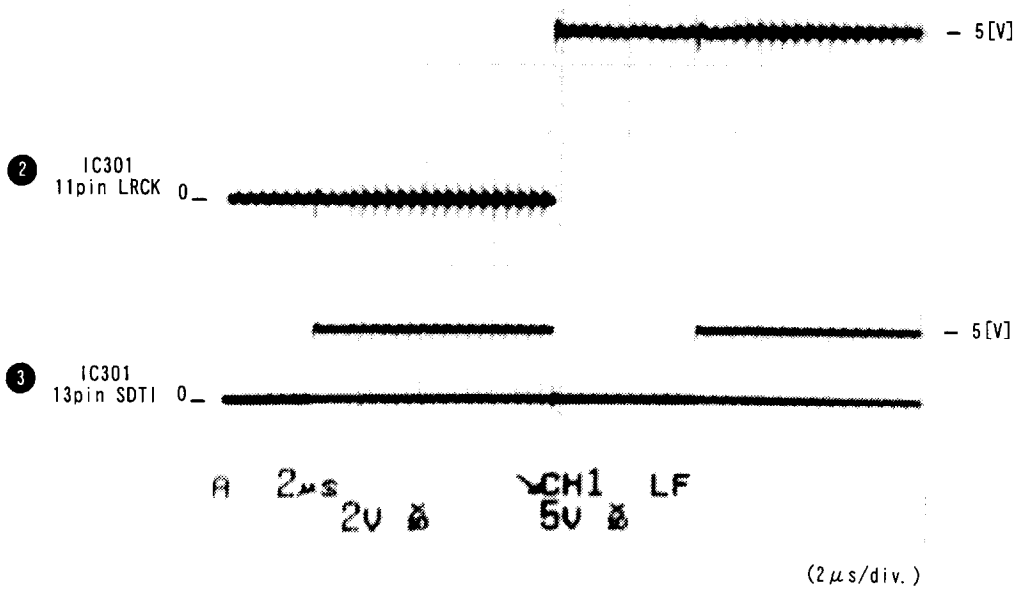
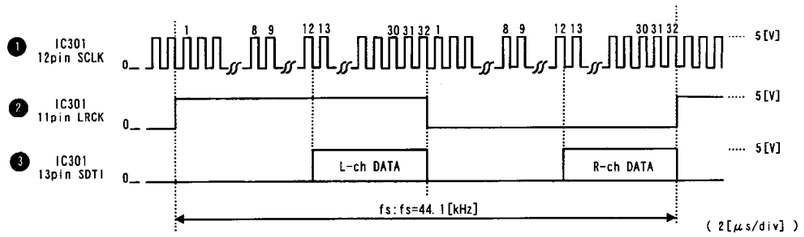


Fig. 4-7 Waveform timing chart of IC301 input side

◆ Technical tip ◆

When the WALKMAN (MiniDisc recorder MZ-R5ST) is played back as a stand-alone unit, the DBB function that is installed the WALKMAN can be used. However, when WALKMAN is connected to station, the DBB function is disabled.



(a) Waveform timing of IC301 input side

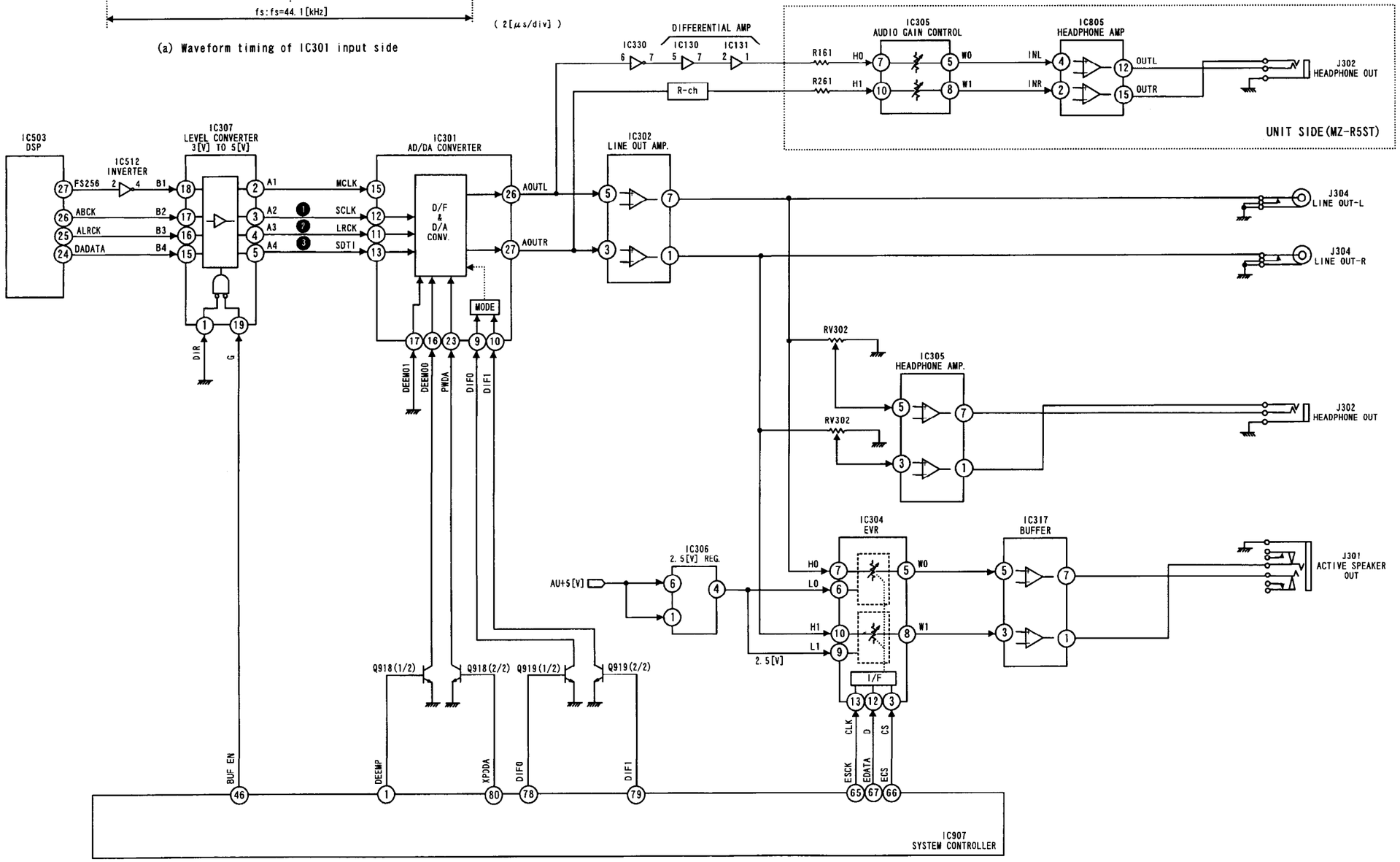


Fig. 4-6 Block diagram of the playback circuit

5. MZ-R5ST MiniDisc RECORDER POWER SUPPLY CIRCUIT THEORY

5-1. Types of Power Supply

MiniDisc recorder can be operated on the four kinds of power supply as shown below.

◆ When MiniDisc recorder is connected to station:
- AC adapter ..... 9.0 V (supplied)

◆ When MiniDisc recorder is used as a stand-alone unit:
- Rechargeable lithium-ion battery (LIP-8) ..... 3.7 V (supplied)
- Dry cell battery (size AA, 2 pcs) ..... 3.0 V (optional)
- Rechargeable nickel-hydrogen battery (BP-DM20) ..... 2.4 V (optional)

Table 5-1 shows the operating hours of each type of battery.

Table 5-1 Comparison of battery operating hours (MZ-R30, MZ-R5ST)

No.	Battery	MZ-R30		MZ-R5ST	
		During recording	During playback	During recording	During playback
1.	Rechargeable lithium-ion battery (LIP-12 (H))	For about 5 hours	For about 8 hours	–	–
2.	Rechargeable lithium-ion battery (LIP-8)	–	–	For about 3.5 hours	For about 5.5 hours
3.	SONY alkaline dry cell (LR6 (size AA) 2 dry cells)	For about 3 hours	For about 6.5 hours	For about 4.5 hours	For about 9 hours
4.	Rechargeable nickel-hydrogen battery (BP-DM20)	For about 3 hours	For about 4.5 hours	For about 4.5 hours	For about 6.5 hours
5.	1+3	For about 8.5 hours	For about 15 hours	–	–
6.	2+3	–	–	For about 8 hours	For about 16 hours
7.	1+4	For about 8.5 hours	For about 14.5 hours	–	–
8.	2+4	–	–	For about 8 hours	For about 13 hours

5-2. Identifying Power Supply

The system controller IC801 identifies from which the main power is supplied, immediately after it is started up. When any battery outside the specifications is used, it stops operation of MiniDisc recorder. The system controller IC801 identifies the type of power supplies from the result of the three kinds of detection.

(1) Pin㉗ [$\overline{\text{DCIN}}$] : When MZ-R5ST is connected to station, it goes to "L".
(2) Pin㊿ [LIMNT (LI + MNT)] : The voltage that is obtained by voltage-dividing-resistor of the lithium-ion battery output voltage.
(3) Pin㊸ [AM3] : The voltage that is obtained by voltage-dividing-resistor of the dry cell or nickel-hydrogen battery output voltage.

Table 5-2 List of power supply identification

	Pin㉗ [$\overline{\text{DCIN}}$]	Pin㊿ [LIMNT]	Pin㊸ [AM3]
When MZ-R5ST is connected to station	L	L	L
When MZ-R5ST is operated on rechargeable lithium-ion battery	H	H	L
When MZ-R5ST is operated on rechargeable nickel-hydrogen battery	H	L	H
When MZ-R5ST is operated on alkaline dry cell	H	L	H

5-3. Circuit voltage

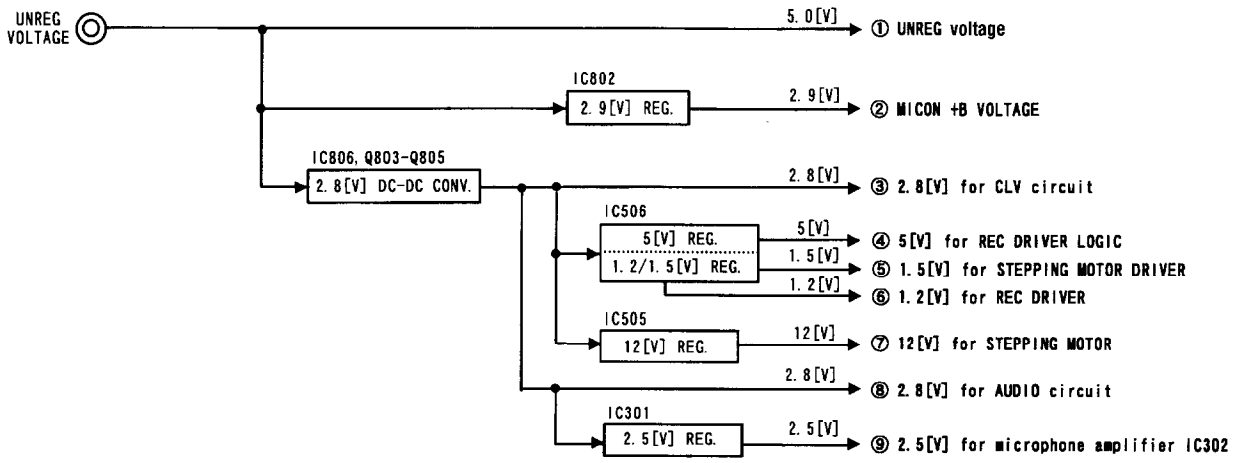


Fig. 5-1 Supply voltages generation block diagram

When MZ-R5ST is connected to station, the following nine kinds of voltage are generated by Mini Disc recorder (MZ-R5ST). (Refer to Fig. 5-1.)

① UNREG voltage → "Supplied from station"
- This is 5.0 V power that is supplied from station.
- This is 5.0 V power for the driver of the coil/motor drive IC505.

② MICON +B voltage → "RESET (2.9 V REG) IC802"
- This is 2.9 V power that is used for driving the system controller IC801.

③ Power for CLV circuit → "2.8 V DC-DC converter (IC806, Q803 to Q805)"
- This is 2.8 V power that is used in the CLV circuit (RF amplifier IC501, digital signal processor IC503, coil/motor drive IC505, etc.)

④ Power for REC DRIVE logic circuit → " 5 V REG (IC506)"
- This is 5.0 V power that is used for driving the logic circuit inside the REC DRIVE IC506.

⑤ Power for stepping motor driver → " 1.2 V/1.5 V REG (IC506)"
- This is 1.5 V power that is used as the H-bridge power supply for stepping motor.

⑥ Power for REC DRIVER → "1.2 V/1.5 V REG (IC506)"
- This is 1.2 V power that is used as the power supply for the over-write head driver during recording.

⑦ Power for stepping motor → " 12 V REG (IC505)"
- This is 12 V power that is used for the power supply of pre-driver inside IC505.
- This 12 V power that is used to drive stepping motor.

⑧ Power for audio circuit → "2.8 V DC-DC converter (IC806, Q803 to Q805)"
- This is 2.8 V power that is used for audio circuit (AD/DA converter IC303, audio gain control IC305, etc.)

⑨ Power for microphone amplifier IC302 → " 2.5 V REG (IC301)"
- This is 2.5 V power that is used to drive the microphone amplifier IC302.

The respective powers are described how they are generated.

1. Generating the UNREG voltage

When DC plug is connected to DC jack of station (MZS-R5ST), the UNREG 5.0 V power that is generated by the power supply circuit of station, is supplied to MiniDisc recorder. Refer to the power supply circuit description of station for more details.

2. Generating the MICON +B voltage

When the UNREG power is supplied to the RESET IC802 pin⑥ [VDD], the MICON +B voltage is generated by the step-up/step-down regulator and is output from pin⑤ [VOUT].

3. Generating the Power for CLV circuit

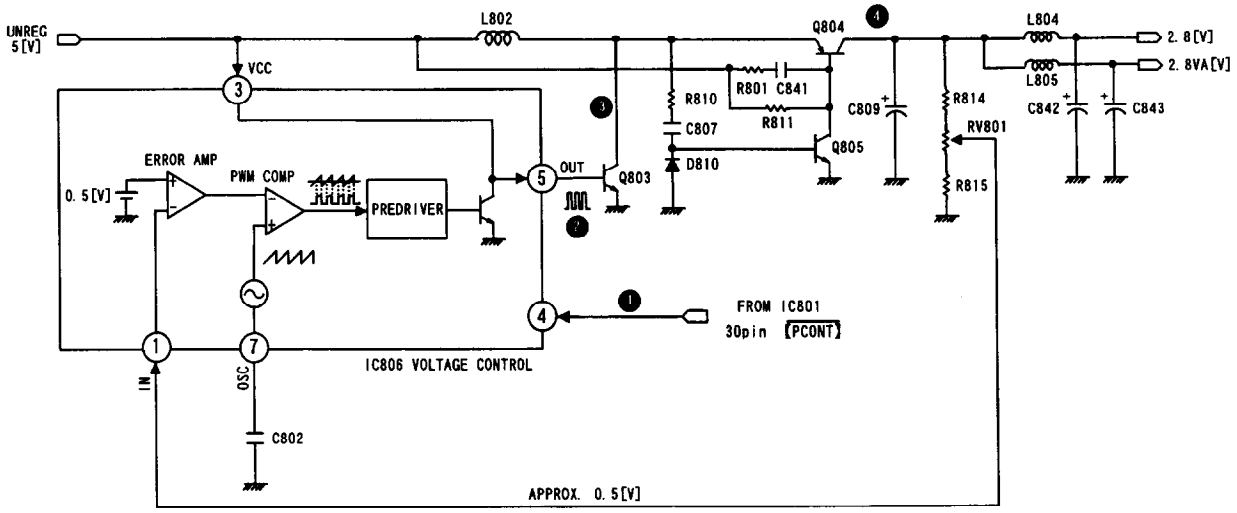


Fig. 5-2. 2.8 V DC-DC converter circuit

Fig. 5-2 shows the 2.8 V DC-DC converter circuit block diagram. The UNREG voltage is supplied to the voltage control IC806 pin③ [VCC], and when output from the system controller IC801 pin㉚ [PCONT] goes to "L", IC806 starts up. When IC806 starts up, PWM waveform that is generated by the internal PWM comparator is output from pin⑤ [OUT].

The PWM waveform is sent to Q803, Q804 and Q805 which start switching operation, and the step-down DC-DC converter circuit starts up too. Output of Q804 is smoothed out by C809, divided by the voltage-divider resistor of R814, RV801 and R815. Output voltage obtained by the voltage-divider resistor is fed back to IC806 pin① [IN]. Based on this feedback voltage, IC806 controls the voltage by controlling the PWM waveform duty generated by the PWM converter inside. Thus the 2.8 V power for CLV circuit and 2.8 V power for audio circuit are generated.

The SLEEP function is described next. The SLEEP function is used in order to realize the low power consumption when MiniDisc is operated on battery such as rechargeable lithium-ion battery. When about ten seconds have passed after MiniDisc recorder enter the STOP state, IC806 is stopped of its operation by setting pin㉚ [PCONT] output to "H". The 2.8V DC-DC converter is stopped by this "H" signal.

Fig. 5-3 shows the waveform timing of the 2.8 V DC-DC converter circuit.

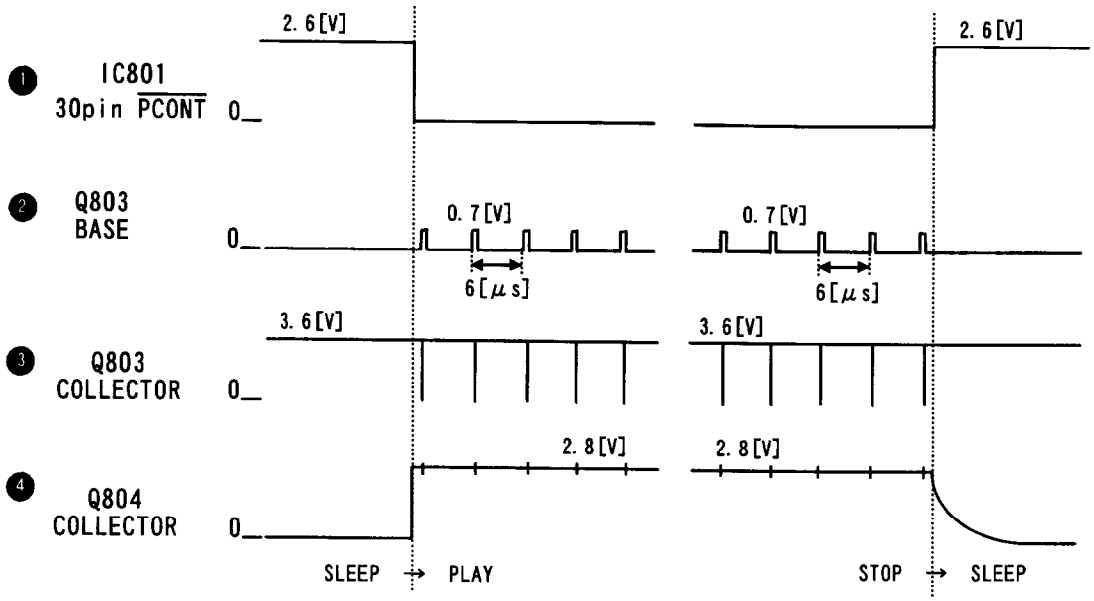


Fig. 5-3 Waveform timing chart (When MiniDisc is operated on rechargeable lithium-ion battery)

4. Generating the REC DRIVE logic voltage

5 V is generated form the CLV circuit voltage 2.8 V by the step-up converter consisting of the REC DRIVE IC506 pin⑦ [VG], L514, D502 and C565. The generated 5 V is used for the logic circuit inside IC506.

5. Generating the power for stepping motor/REC driver

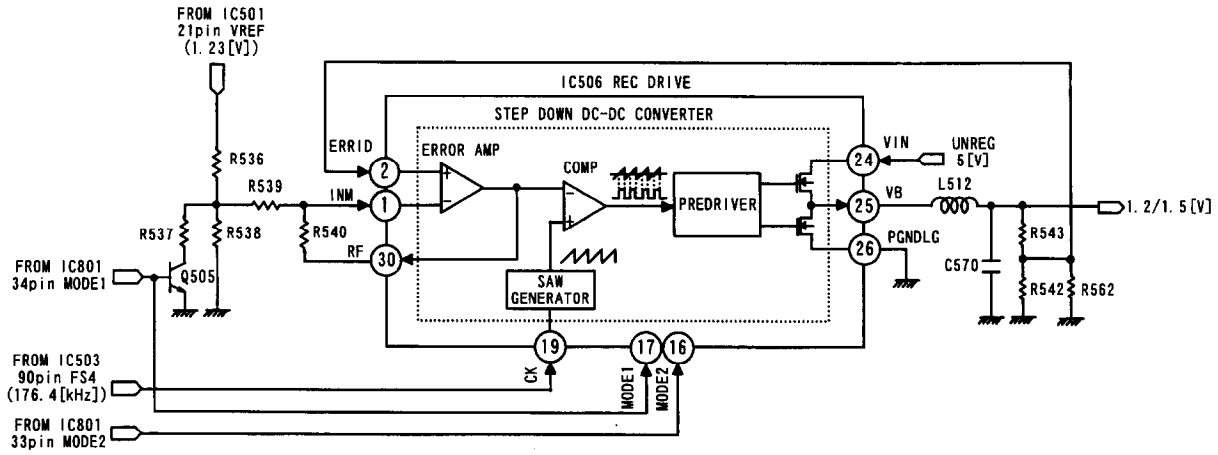


Fig. 5-4 1.2 V/1.5 V regulator block diagram

Fig. 5-4 shows block diagram of the 1.2 V/1.5 V regulator circuit. The mode setting table of the REC DRIVE IC506 is shown in Table 5-3. IC506 switches the internal operating mode according to the control signal output from pin㉞ [MODE1] and pin㉝ [MODE2] of the system controller IC801 as shown in the table. When stepping motor is activated, the system control IC801 outputs "L" signal from pin㉞ [MODE1] and also "L" from pin㉝ [MODE2]. Q505 is turned "OFF" by this "L" signal. As a result, the step-down regulator inside IC506 becomes the 1.5 V regulator, and 1.5 V is output from pin㉕ [VB] of IC506.

Next, during recording mode, the system controller IC801 outputs "H" signal from pin㉞ [MODE1] and "L" from pin㉝ [MODE2]. Q505 is turned "ON" by this "H" signal. As a result, the step-down regulator inside IC506 becomes the 1.2 V regulator, and 1.2 V is output from pin㉕ [VB] of IC506. Thus the step-down regulator inside IC506 is switched of its operation by changing the reference voltage of error amplifier as Q505 is turned on or off.
At the same time, the sawtooth wave that is generated internally by IC506, is generated based on 176.4 kHz signal which is output from the digital signal processor IC503 pin㊿ [FS4].

Table 5-3 List of IC506 mode settings

MODE 1	MODE 2	STEP UP REG	STEP DOWN REG	EFM logic block	Operation mode
H	H	STOP	STOP	STOP	During STOP and PLAY
L	H	POWER ON	STOP	STOP	Not used
L	L	POWER ON	POWER ON 1.5 V output	STOP	When stepping motor is operating
H	L	POWER ON	POWER ON 1.2 V output	POWER ON	During recording

6. Generating the power for stepping motor

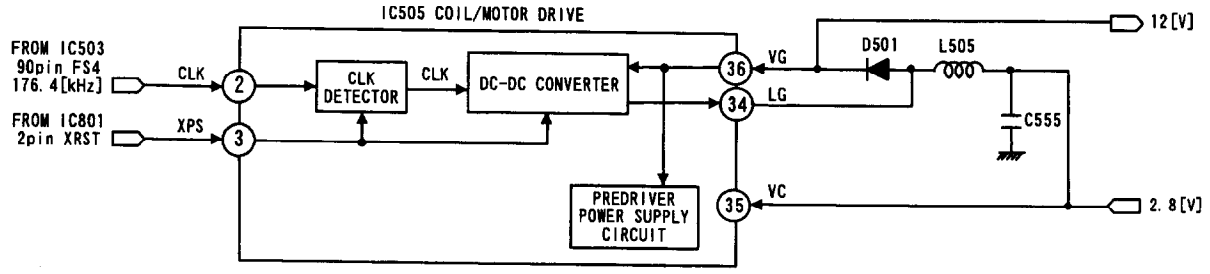


Fig. 5-5 12 V DC-DC converter circuit

Fig. 5-5 shows block diagram of the 12 V DC-DC converter. The coil/motor drive IC505 has the 12 V DC-DC converter internally in it. The 12 V DC-DC converter starts operating when coil (L505), switching diode (D501) and smoothing capacitor (C555) are externally connected. The 12 V DC-DC converter generates the power supply voltage to be used by the pre-driver inside IC505, and the 12 V power supply voltage for stepping motor. This 12 V DC-DC converter operates in synchronization with the clock (176.4 kHz) supplied from the digital signal processor IC503 pin⑨⓪ [FS4].

7. Generating the power for microphone amplifier IC302

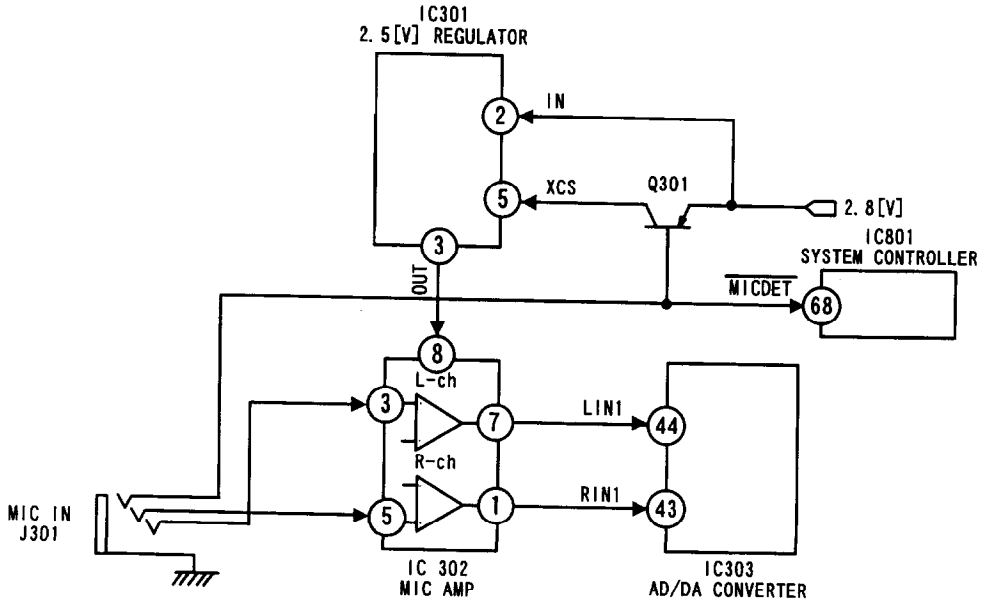


Fig. 5-6 Generation of microphone amplifier IC302 drive voltage

Fig. 5-6 shows block diagram to generate the microphone amplifier IC302 drive voltage. When microphone plug is connected to the MIC jack as shown, input to the system controller IC801 pin⑥⑧ [$\overline{\text{MICDET}}$] goes to "L". Q301 is turned "ON" by this "L" signal. Then 2.8 V is supplied to the 2.5 V regulator IC301 pin⑤ [XCE] that starts up IC301. When IC301 starts, 2.5 V is generated by internal series regulator and is output from pin③ [OUT] that activates the microphone amplifier IC302.

5-4. Theory When MiniDisc Recorder Is Operated On Battery

Fig. 5-7 shows the power supply circuit when MiniDisc is operated on battery.

1. Operation when MiniDisc is operated on rechargeable lithium-ion battery.

When a rechargeable lithium-ion battery is connected, battery voltage is applied to the RESET IC802 pin⑥ [VDD] via a diode inside the dual N-channel MOS FET IC808. When IC802 is started up, the MICON +B 2.9 V is generated by the step-up/step-down regulator inside IC802. IC802 outputs the generated 2.9 V from pin⑤ [VOUT] to the system controller IC801 pin⑰ [VDD]. As the system controller IC801 is started up, the system controller IC801 detects whether a rechargeable lithium-ion battery is connected or not at pin⑩ [LIMNT (LI + MNT)]. When the system controller IC801 detects that a lithium-ion battery is connected, it outputs "H" from pin⑪ [BATTON]. When this "H" signal is output, the 12 V power that is generated by the coil/motor drive IC505 is divided by the voltage-divider resistor R830/R831 to develop about 9 V that is sent to the dual N-channel MOS FET IC808 pin⑤ [NG2] so that the N-channel FET is turned on. Then the UNREG 3.7 V is output from IC808 pin⑧ [ND2].

2. Operation when MiniDisc is operated on external battery.

When external battery such as nickel-hydrogen battery is connected, battery voltage is applied to the RESET IC802 pin⑥ [VDD] via D801 to start up IC802. The RESET IC802 has the built-in power supply voltage detection circuit which maintains the VDD input voltage to 3.4 V or higher by the self step-up circuit consisting of L801, D808, C831 and the switching output of pin⑧[LX]. At the same time, when IC802 is started up, the MICON +B 2.9 V is generated by the step-up/step-down regulator inside IC802. IC802 outputs the generated 2.9 V from pin⑤ [VOUT] to IC801 pin⑰ [VDD]. When the system controller IC801 is started up, the system controller IC801 detects whether external battery is connected or not at pin⑬ [AM3]. If IC801 detects that external battery is connected, it outputs "H" from pin㉙[XAMCN]. When this "H" signal is output, the 12 V power that is generated by the coil/motor drive IC505 is divided by the voltage-divider-resistor R825/R803 to develop about 9 V that is sent to the dual N-channel MOS FET IC808 pin④ [NG1] so that the N-channel FET inside IC808 is turned on. Then the UNREG 3.0 V is output from IC808 pin① [ND1].

■ The respective voltage outputs

The power supply voltages are supplied in the same way as when MiniDisc recorder is connected to station (MZS-R5ST). Refer to section "5-3 Circuit Voltage, sub-sections 3 to 9" for more details.

◆ Technical tip ◆

The dual N-channel MOS FET IC808 has an internal diode. Because forward voltage (Vf) of this diode is above 0.7 V, it can have a case that MiniDisc cannot surely starts working when the power supply voltage is low using size AA battery or like. Therefore, D801 is installed in MiniDisc.

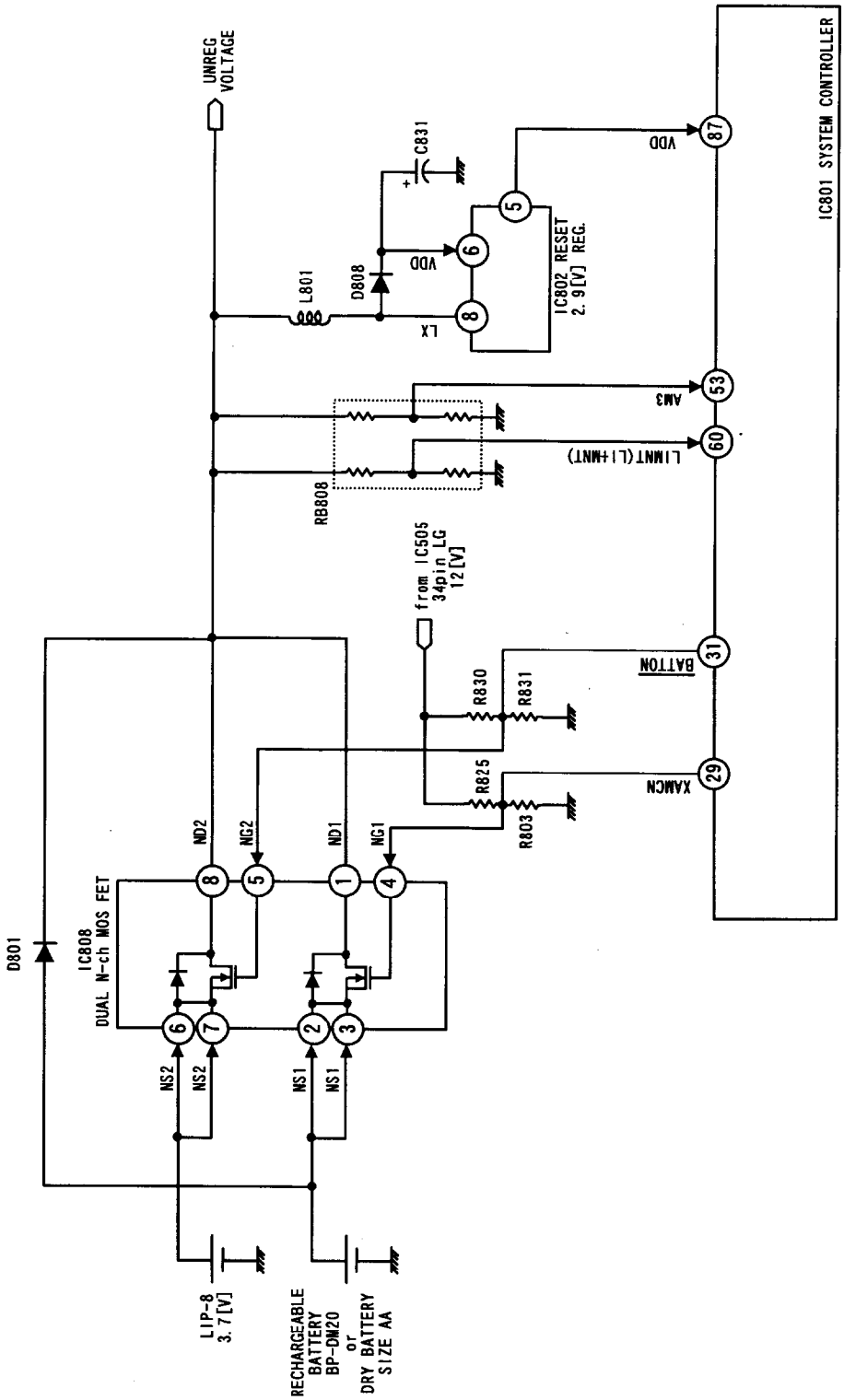


Fig. 5-7 Power supply circuit when MiniDisc recorder operates on battery

SONY

9-923-279-31

Sony Corporation
Personal A&V Products Company

98D16034-1D
Printed in Japan ©1998.4
Published by Quality Engineering Dept.
(Shibaura)

NEW TECHNICAL THEORY
FOR SERVICING

MZ-R5ST
OPERATION MANUAL

PORTABLE MINI DISC RECORDER

SONY

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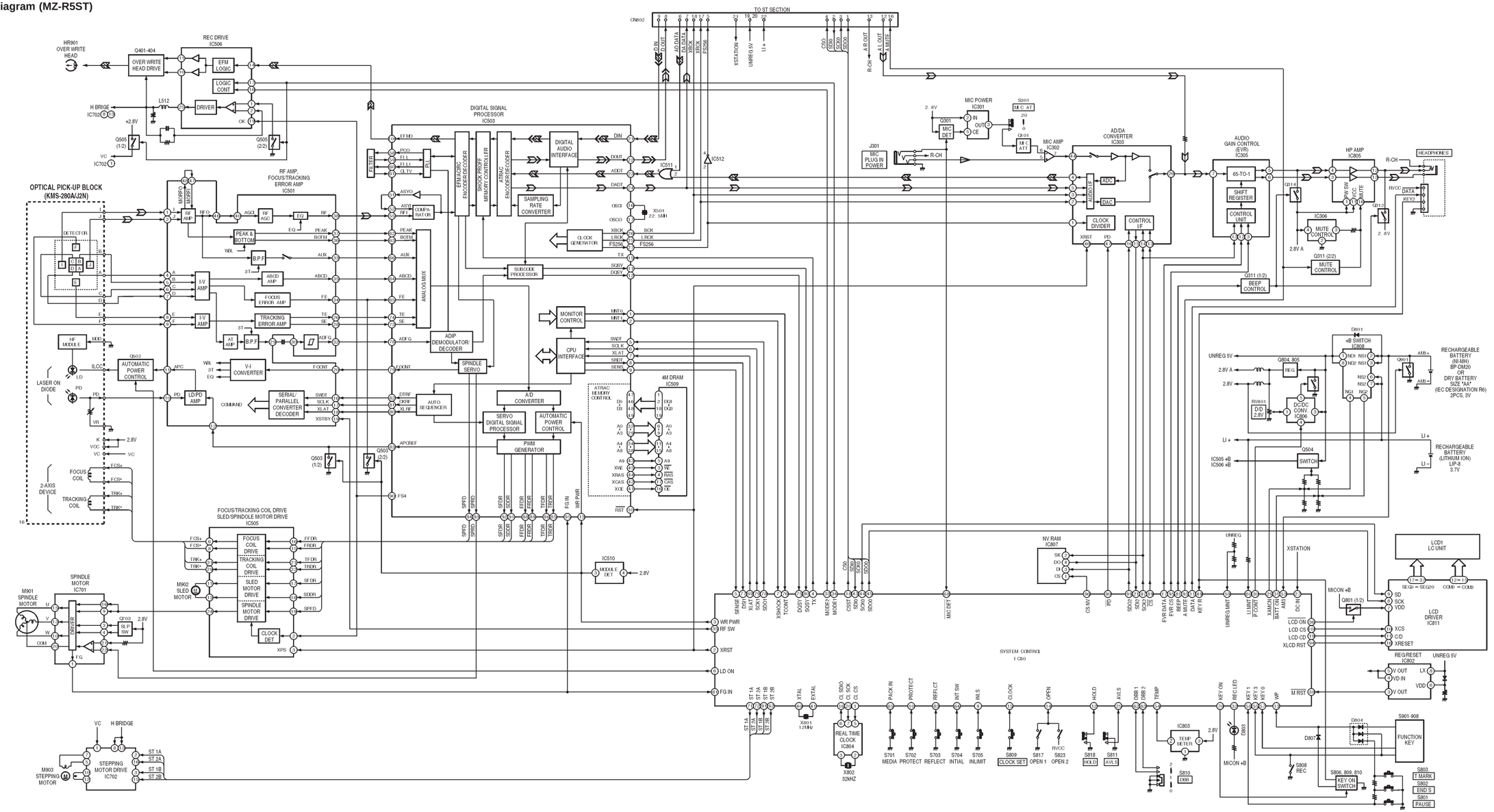
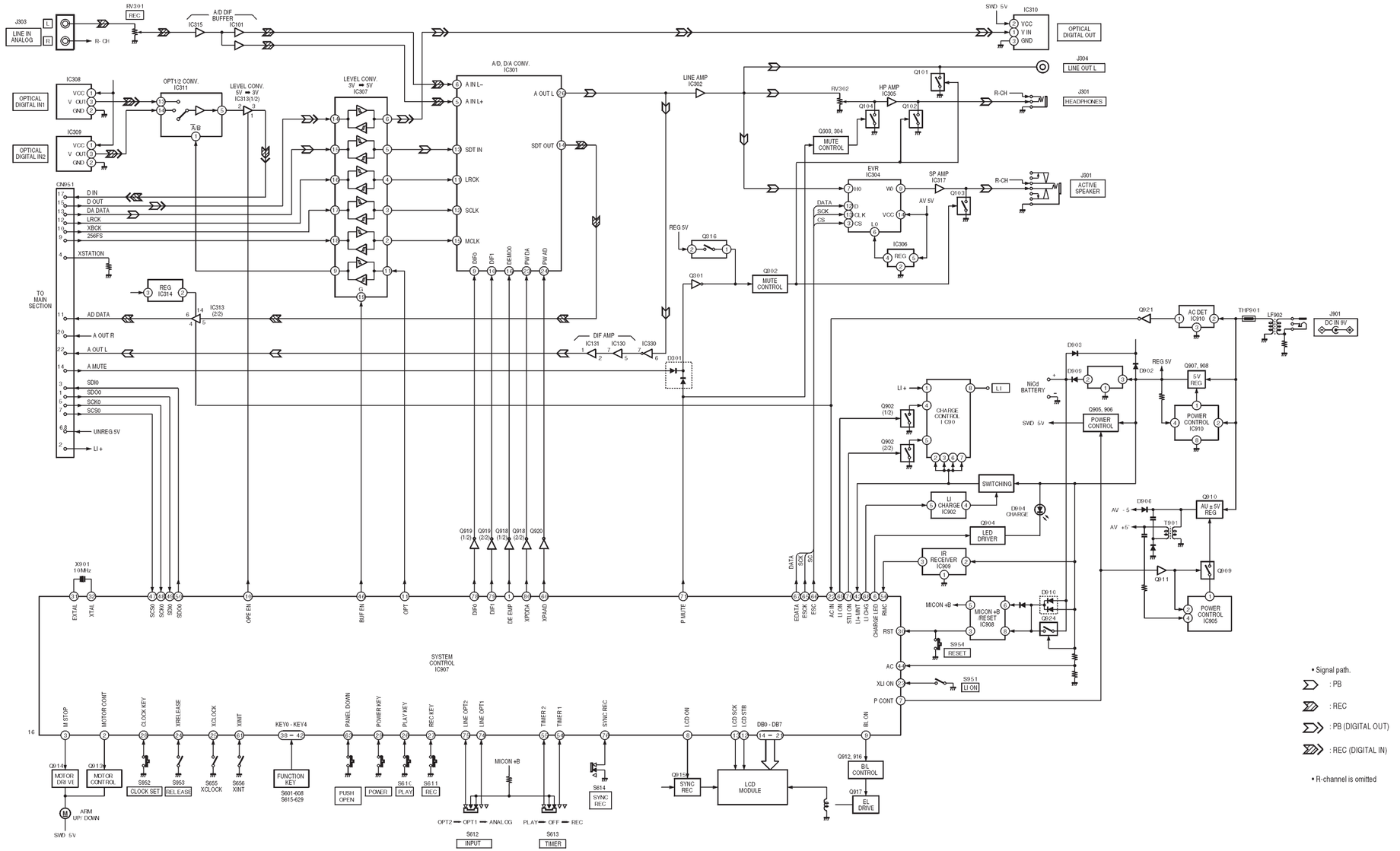
This NEW TECHNICAL THEORY FOR SERVICING describes theory of station (MZS-R5ST) and power supply circuit of MiniDisc recorder (MZ-R5ST).
Refer to MZ-R30 NEW TECHNICAL THEORY FOR SERVICING for theory of MiniDisc recorder.

1. BLOCK DIAGRAMS

1-1. Block Diagram (MZ-R5ST)



1-2. Block Diagram (MZS-R5ST)



2. FUNCTIONS AND FEATURES

MZ-R5ST is the new Sony portable MiniDisc Recorder of the fourth generation using the wide bit stream technology that is the first in the world as a portable MiniDisc Recorder. MZ-R5ST has the following functions and features.

- Compact and slim recording/playback unit : The MiniDisc Recorder is made small and compact as it has the limited functions of playback and recording (microphone recording only), and the editing function is handled by the station. Thus the size as thin as 20.1 mm and as light as 185 g (almost equal to the conventional potable MD player) is realized.

- Built-in Sampling Rate Converter : MZ-R5ST has the built-in sampling rate converter that enables recording from digital equipment using other sampling rates as DAT deck or a satellite tuner.
(Sampling frequencies: 32 kHz, 44.1 kHz and 48 kHz are supported)

- Wide Bit Stream Technology : The input circuit, the output circuit and their peripheral circuits operate on the 20-bit audio data so that the maximum performance of the ATRAC IC which operates on 20-bit and higher can be fully utilized.

- Synchronous Recording Function : When dubbing digital signal from a source digital equipment such as CD player to MZ-R5ST using optical digital cable, operation is simple without the need to operate both the source side equipment and this unit.

- Time Machine Recording Function : Time Machine recording always stores the input sound into the DRAM IC in MZ-R5ST so that the sound that is two seconds ahead of pressing the record button can be recorded. This functions convenient not to miss recording of the very beginning of the program when recording off-the-air program of satellite broadcast or FM broadcast.

- Built-in Rehearsal Function : Editing points can be checked in units of 0.06 seconds in the range of 256 steps (total 8 seconds) from –128 step to +127 step centering around the editing point. This function is convenient in the editing such as Divide editing.

- Built-in UNDO Function : UNDO function lets operator undo an editing operation when operator makes an operational error.,

- Output Jack For Active Speakers : The STEREO-MINI output terminal for active speakers is equipped. Sound volume of the active speakers can be controlled by key operation of station or key operation of remote controller.

Differences of functions between the 4th generation MiniDisc recorder (MZ-R30) and MZ-R5ST are shown below.

Table 2-1 Comparison of functions between the 4th generation MiniDisc recorder (MZ-R30) and MZ-R5ST

Functions of MiniDisc recorder	MZ-R5ST	MZ-R30
Headphones output	○	○
LINE output	MiniDisc recorder : X Station side : ○	○
Digital output	MiniDisc recorder : X Station side : ◎	X
Active speaker output	◎	X
LINE input	MiniDisc recorder : X Station side : ○	○
Digital input	MiniDisc recorder : ○ Station side : ◎ (2 inputs)	○ (1 input)
Microphone input	MiniDisc recorder : ○ (External stereo) Station side : X	○ (External stereo)
AVLS	○	○
DBB (Digital Bass Boost)	○	○
RESUME	○ (Always ON)	○ (Always ON)
BEEP	○	○
Monaural recording	○	○
Monaural playback	○	○
Automatic track mark	○	○
Character input	○	○
Sampling rate converter	MiniDisc recorder : ○ Station side : X	○
20-bit wide bit stream	◎	X
Synchro-recording	◎	○
Time Machine recording	◎	X
Timer standby function	◎	X
Program playback	◎	X
Rehearsal function	◎	X
Undo function	◎	X

Note : The mark ◎ in the table indicates the new functions.

3. CIRCUIT THEORY OF MZ-R5ST STATION

3-1. System Configuration

(1) System Configuration of MiniDisc Recorder (MZ-R5ST).

Fig. 3-1 shows system configuration (MZ-R5ST). MiniDisc recorder (MZ-R5ST) is described briefly as follows.

First, the flow of signals during recording is described. The MIC IN signal that is passed through the microphone amplifier IC302 inputs the AD/DA converter IC303 where the microphone signal is converted to the 16-bit digital data by a built-in A/D converter. The digital signal is sent to the DSP IC503 via the OR gate IC511. During LINE recording , the 20-bit digital data that is A/D converted by the station (MZS-R5ST) (refer to the next section of this manual (2) System Configuration of Station (MZS-R5ST) for more details), is input to the DSP IC503 via the OR gate IC511. The other input that is the DIGITAL IN input signal, is input directly to the DSP IC503 . At IC503, signal processing (compression, interleaving, EFM modulation, etc.) is performed on the input digital data to generate the EFM signal. The EFM signal thus generated is recorded on the MO disc via the REC DRIVE IC506.

Next, the flow of signals during playback is described. The EFM signal that is read by the optical pickup is input to the DSP IC503 via the RF amplifier IC501. At IC503, signal processing (EFM demodulation, de-interleaving, expansion, etc.) is performed on the input EFM signal to generate the DA data. When the MiniDisc recorder (MZ-R5ST) is used as a stand-alone unit, the DA data is sent to the AD/DA converter IC303 where the DA data is passed through the internal DBB (Digital Bass Boost) circuit, digital filter and is converted to the L-channel and R-channel analog signal by D/A converter. The D/A converted L-channel and R-channel analog signal passes through the audio gain control IC305, headphones amplifier IC805 and then to HEADPHONES. When station unit is connected, the DA data is output to the AD/DA converter IC301 of the station connected.

Next, the flow of the servo signals is described below. The error signals that are read by optical pickup are sent to the DSP IC503 after passing the various error amplifiers inside the RF amplifier IC501. In the DSP IC503, the input error signals are performed the servo calculations by the internal digital servo processor to generate the servo signal. The servo signals are then output and used to drive coils and motors via the coil/motor drive IC505.

The system controller IC801 is described lastly. The system controller IC801 controls the whole system of the MZ-R5ST. The main control functions of the respective ICs and the input signals that are controlled by the system controller IC 801 are shown below.

◆Controls the DSP IC503 : • Control of the respective servo processings.
• Selection of mode (recording or playback) of the respective signal processing blocks
• Control of input sound source (AD data or digital data), etc.
◆Controls the RF amplifier: Selection of mode (PIT or GROOVE) of the RF amplifier, etc.
◆Controls the audio gain control IC305 : Control of the output volume
◆Controls the AD/DA converter IC303 : Control of the DBB circuit, etc.
◆Controls the NV RAM IC807: Control of the E-F balance values during servo processing
◆Controls the stepping motor drive IC702
◆Controls the REC DRIVE IC506
◆Communication with the system controller IC907 of station unit
◆Controls the input signals from keys and switches
◆Controls temperature inside the MiniDisc recorder
◆Controls the clock information
◆Drives LCD

(2) System Configuration of Station (MZS-R5ST).

Fig. 3-2 shows system configuration (MZS-R5ST). Station (MZS-R5ST) is described briefly as follows.

First, the flow of signals during recording is described . When station (MZS-R5ST) is in the LINE recording mode, the L-channel and R-channel analog signals that are input from the LINE IN JACK J303 are sent to the AD/DA converter IC301 via the LINE amplifier IC315, the differential buffers IC101 and IC201. The LINE input signal is converted to the 20-bit digital data by the A/D converter inside IC301. The 20-bit digital data is output to MiniDisc recorder (MZ-R5ST). The digital recording mode is described next. The station (MZS-R5ST) has the two channel digital inputs. The digital signal that is input from the DIGITAL IN is sent to the DIN selector IC311. The station (MZS-R5ST) has the recording source selector switch. When operator operates the recording source selector switch, result of selection is input to the system controller IC907 so that IC907 recognizes the selected recording source and controls the selector switch inside the DIN selector IC311. Thus the digital data that is going to be output to MiniDisc recorder (MZ-R5ST), is determined. The digital data that is selected by the DIN selector IC311 is output to MiniDisc recorder (MZ-R5ST) via the level converter IC313.

Next, the flow of signals during playback is described. The DA data that is output from the DSP IC503 of MiniDisc recorder (MZ-R5ST), is input to the AD/DA converter IC301 where the DA data is passed through the digital filter and is converted to the L-channel and R-channel analog signals by D/A converter. The D/A converted L-channel and R-channel analog signals are output to the LINE OUT jack J304 via the LINE amplifier IC302, output to the HEADPHONES OUT jack J302 via the LINE OUT amplifier IC302, PB VOLUME RV302 and headphones amplifier IC305. The D/A converted L-channel and R-channel analog signals are also output to the ACTIVE SPEAKER OUT jack J301 via the LINE OUT amplifier IC302 and buffer IC317, and is at the same time output to the AUDIO GAIN control IC305 of MiniDisc recorder (MZ-R5ST) via a differential amplifier.

The system controller IC907 is described lastly. The system controller IC907 controls the whole system of MZS-R5ST. The main control functions of the respective ICs and the input signals that are controlled by the system controller IC907 are shown below.

◆Controls the DIN selector IC311 : Control of the digital data (DIN1 or DIN2) that is going to be output to MiniDisc recorder (MZ-R5ST)
◆Controls the level converter : Selection of POWER ON/OFF
◆Controls the EVR IC304 : Control of the output volume for active speakers
◆Controls the AD/DA converter IC301 : Control of ON/OFF of the A/D converter and D/A converter, etc.
◆Communication with the system controller IC801 of MiniDisc recorder (MZ-R5ST)
◆Controls the input signals from keys and switches
◆Drives LCD

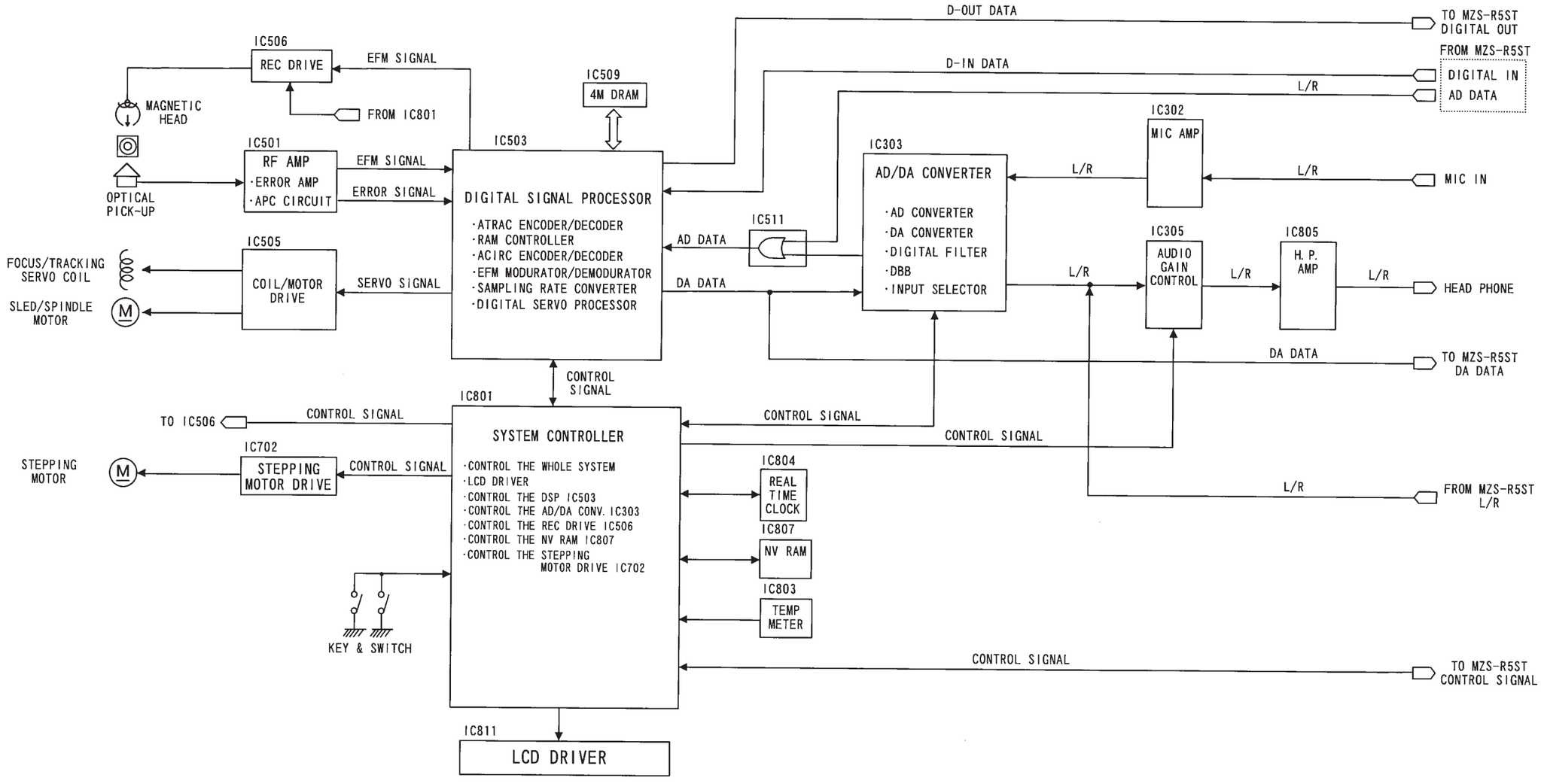


Fig. 3-1 System configuration (MZ-R5ST)

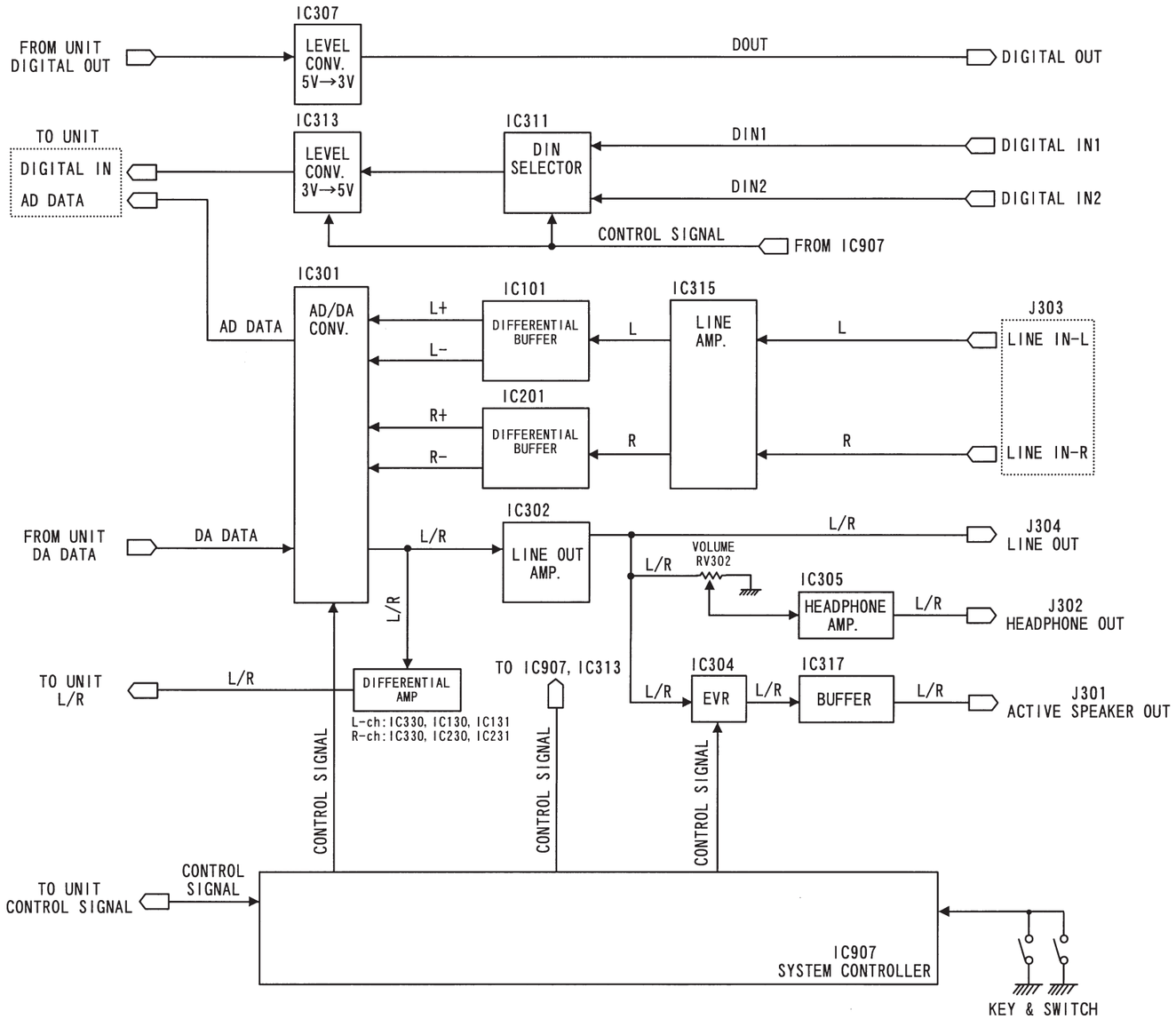


Fig. 3-2 System configuration(MZS-R5ST)

3-2. Microprocessor Interface

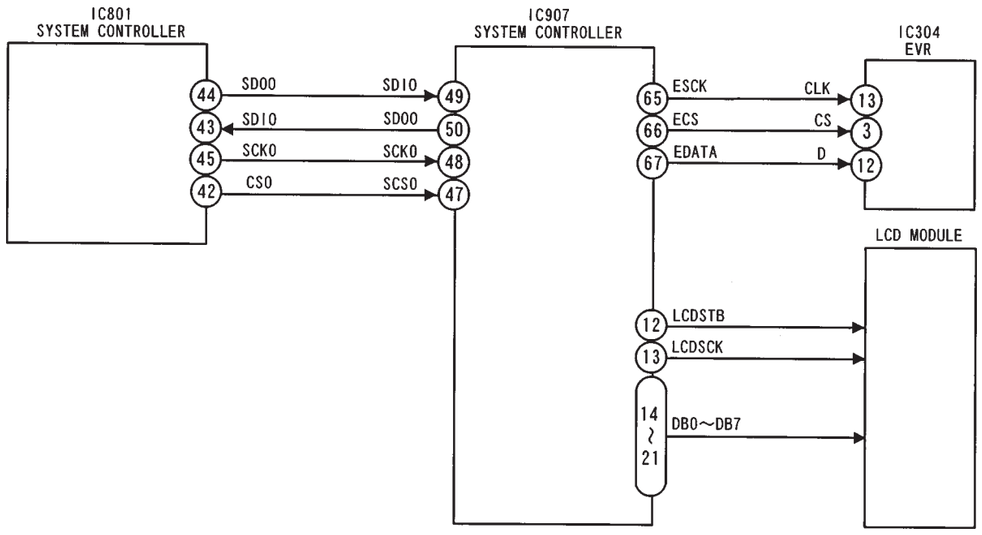


Fig. 3-3 Microprocessor interface

Fig. 3-3 shows microprocessor interface between station unit and MiniDisc recorder.

1. Communication between system controller IC801 and IC907

The system controller IC801 of MiniDisc recorder sends the various commands in the form of serial data to the system controller IC907 of station in order to establish communication between them. These serial data are output from IC801 pin$¢ [SD00] to the system controller IC907 of station, in synchronization with clock signal that is output from pin$× [SCK0] and chip select signal from pin$™ [CS0]. The system controller IC907 of station reads the serial data and executes the operations in accordance with the input serial data. When the data-read command is issued, the data that corresponds to the command, is output from pin%° [SD00] in synchronization with the clock that is input to pin$• [SCK0].

The main interfaces are shown below.

◆ From system controller IC907 (station) ⇒ System controller IC801 (MiniDisc recorder)
- Input data from operation keys
- Selection of recording mode (Stereo/Monaural, Digital/Analog), etc.

◆ From system controller IC801 (MiniDisc recorder) ⇒ System controller IC907 (station)
- Presence or absence of rechargeable lithium-ion battery
- LCD display data
- Time information
- Disc information (Presence or absence of disc, CD or MO, copy protection) etc.

2. Communication between system controller IC907 and EVR IC304

When the system controller IC907 detects that the active speaker VOLUME key is pressed at pin 41 [KEY3] or pin 51 [RMC] input, IC907 outputs data from pin 67 [EDATA] to EVR IC304 in synchronization with the clock at pin 65 [ESCK] and the chip select signal at pin 66 [ECS]. Output data from IC907 controls the output signal from ACTIVE SPEAKER OUT J301.

3. Communication between system controller IC907 and LCD block

The system controller IC907 controls the display data by transferring data to the LCD module through the 8 parallel data. The display data is output from the eight data output pins of pin 14 [DB0] through pin 21 [DB7], to the LCD module in synchronization with clock at pin 13 [LCD SCK] and the strobe signal at pin 12 [LCD STB].

3-3. Power Supply Circuit

Fig. 3-4 shows a block diagram of the power supply circuit (MZS-R5ST).

(1) Generating the UNREG power supply voltage

When the DC plug is inserted to the DC jack, 9 V is input to POWER CONTROL1 IC904 pin 2 [VCC] via a line filter LF902, which starts up IC904. As IC904 starts up, the PWM waveform that is generated by the internal PWM comparator, is output from pin 1 [OUT]. Q908 and Q907 start switching operation as a result of this PWM waveform output, and the step-down DC-DC converter circuit is started up. After the Q907 output is smoothed by D905, L903 and C908, the voltage resistance-divided by R915 to R917 is fed back to pin 4 [INPUT] of IC904. Based on this feedback voltage, IC904 controls the voltage by controlling the PWM wave duty generated by the PWM comparator inside. As a result of this operation, the UNREG 5 V is generated. (Refer to Fig. 3-7 and Fig. 3-8.)

(2) Generating the 2.9 V for system controller IC801

The UNREG voltage that is generated by the UNREG power generating circuit, is input to the RESET IC908 pin 6 [VDD]. When IC908 starts up, 2.9V is generated by the internal step-up/step-down regulator. And 2.9V is output from pin 5. The output 2.9 V is input to the system controller IC907 pin 72 [VDD] to start up the system controller IC907.

(3) Generating the SWD 5 V

When system controller IC907 starts up, IC907 detects whether MiniDisc recorder (MZ-R5ST) is connected to station or not, from state of pin 25 [XLOCK] ("L": when MiniDisc recorder is connected). When MiniDisc recorder is connected to station, and when the POWER key S609 is pressed to set the pin 29 [POWERKEY] input to "L", the system controller IC907 outputs "H" from pin 7 [PCONT]. Q906 and Q905 are turned "ON" by this "H" signal so that the UNREG voltage is supplied as the SWD 5 V to the respective ICs such as DIN SELECTOR IC311 and others. When MiniDisc recorder has not been connected to station and is connected later, output from IC907 pin 7 [PCONT] goes to "H" immediately.

Fig. 3-5 shows the timing chart when the POWER key is pressed with MiniDisc recorder connected to station.

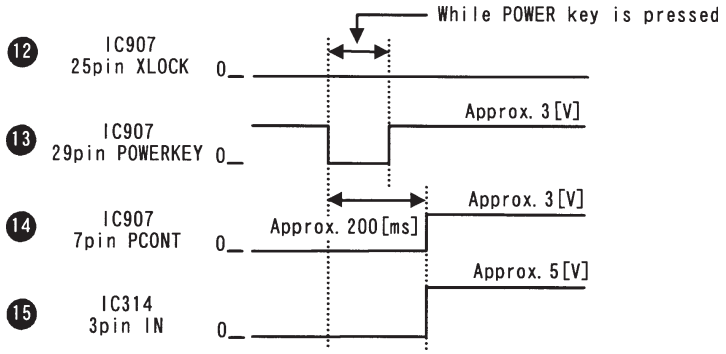


Fig. 3-5 Timing chart when the POWER key S609 is pressed

(4) Generating the 2.9 V for the level converter IC313

The SWD 5 V is supplied to the 2.9 V REG IC314 pin 3 [IN] to start up IC314. As IC314 is started up, the 2.9 V is generated by internal series regulator and is output from pin 2 [OUT]. The 2.9 V is output to the level converter IC313 as its startup voltage.

(5) Generating the AUDIO ±5 V

Fig. 3-6 shows the waveform timing chart when generating the AUDIO ±5 V. When the system controller IC907 is started with MiniDisc recorder connected to station, "H" signal is output from pin7 [PCONT]. Q911 (1/2) and (2/2) are turned "ON" by this "H" signal so that the 9 V that is input to the DC jack, is supplied to the POWER CONTROL2 IC905 pin 2 [VCC] through the line filter LF902 and L904. When IC905 starts up, the PWM waveform that is internally generated by the built-in PWM comparator, is output from pin 1 [OUT]. Q910 is started the switching operation by this PWM waveform, and the step-down DC-DC converter circuit is started up. Then output of Q910 (refer to **6** of Fig. 3-6) is input to T901 where its energy is converted (refer to **7** of Fig. 3-6), smoothed by T901 coil and C911 to generate +5 V (refer to **8** of Fig. 3-6). The +5 V is voltage-divided by the voltage-divider-resistor of R918 to R920, R955 and R922. Output voltage from the divider is fed back to IC905 pin4 [INPUT]. Based on this feedback voltage, IC905 controls the voltage by controlling the PWM waveform duty generated by the internal PWM comparator. The AUDIO +5 V is thus generated. The AUDIO +5 V is supplied to the AUDIO circuit via smoothing circuit of L902 and C906. (Refer to Fig. 3-9.)

Output of Q910 (refer to **6** of Fig. 3-6) is smoothed out by D906 and a negative voltage power is generated. (Refer to **10** of Fig. 3-6.) The negative voltage power is removed of ripple by L901, C905 and C909, and the AUDIO –5 V (Refer to **11** of Fig. 3-6.) is generated. (Refer to Fig. 3-9.)

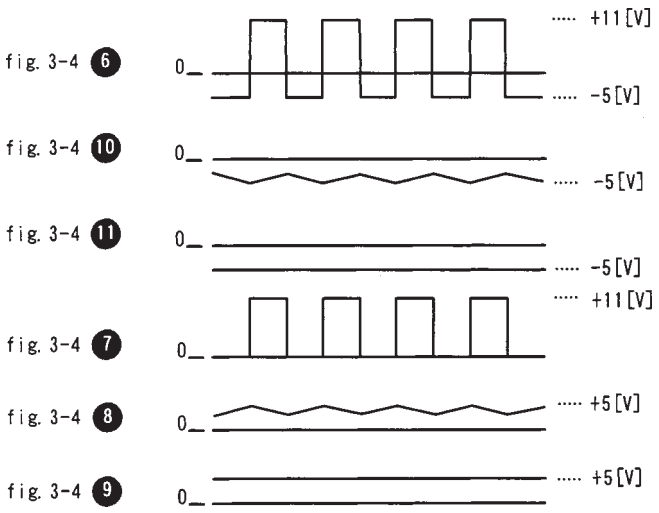


Fig. 3-6 Waveform timing when generating the AUDIO ±5 V

(6) Generating 2.5 V to be used inside EVR IC304

When the AUDIO +5 V is input to pin 6 [IN] of the 2.5 V REG. IC306. The 2.5V is generated by the internal series regulator. The 2.5 V is output from pin 4 [OUT] and used as the internal power supply voltage of EVR IC304.

(7) Operation of voltage detector IC910

Whether AC power is input to station or not, is detected at pin 22 [ACIN] of the system controller IC907. ("L": when AC power is connected.) The voltage detector IC910 is installed in order to change the port input of pin 22 [ACIN] earlier, when AC power cord is removed from station. When input to IC910 pin 2 becomes lower than 4.5 V, FET inside IC910 is turned on so that "L" is output from pin 1. Q921 is turned off by this "L" signal. And "H" is input to pin 22 [ACIN] of system controller IC907 .

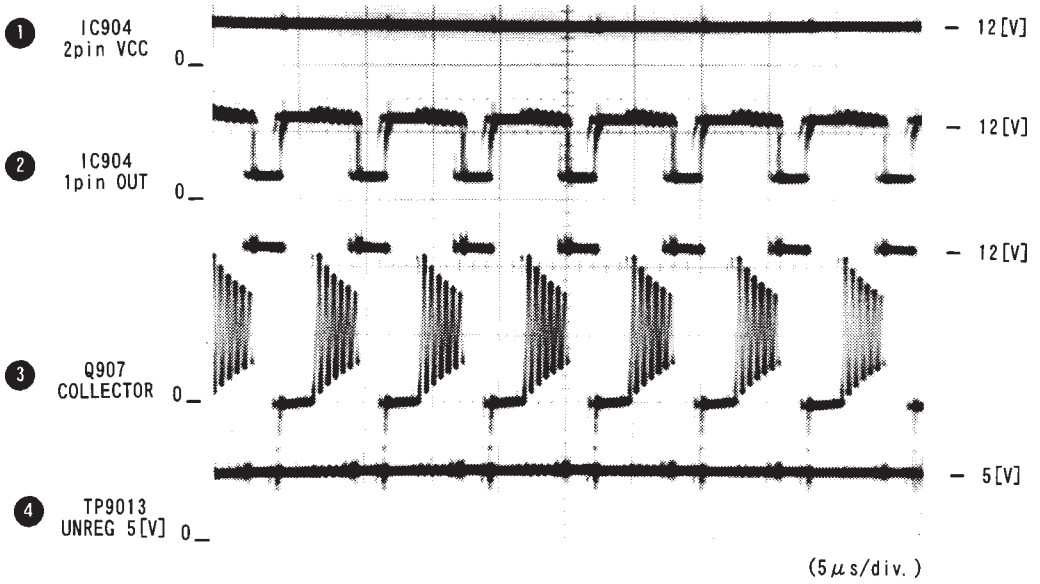


Fig. 3-7 UNREG power supply voltage generator circuit waveform timing chart
(when MiniDisc recorder is not connected to station)

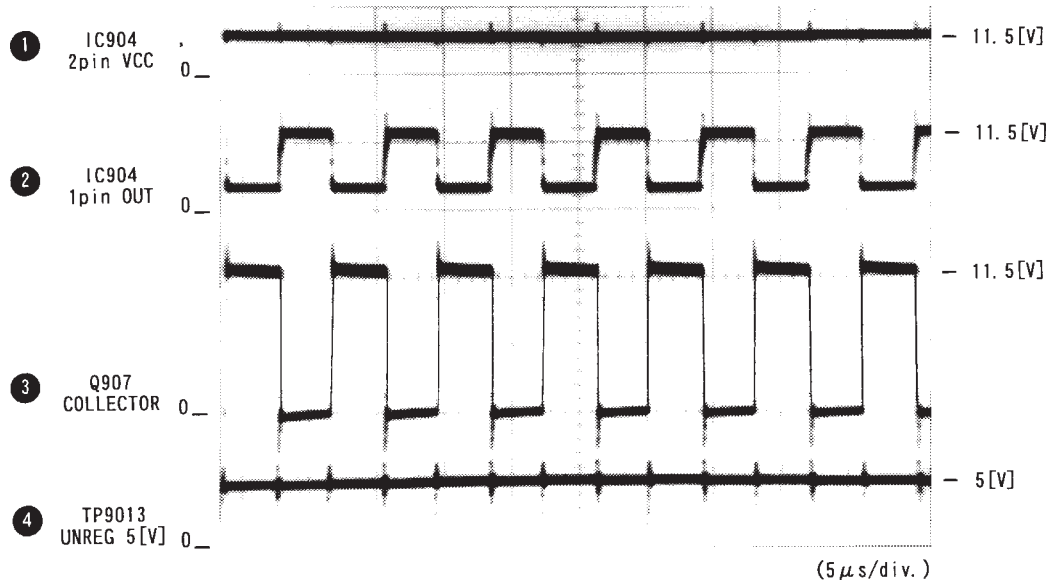


Fig. 3-8 UNREG power supply voltage generator circuit waveform timing chart
(when MiniDisc recorder is connected to station)

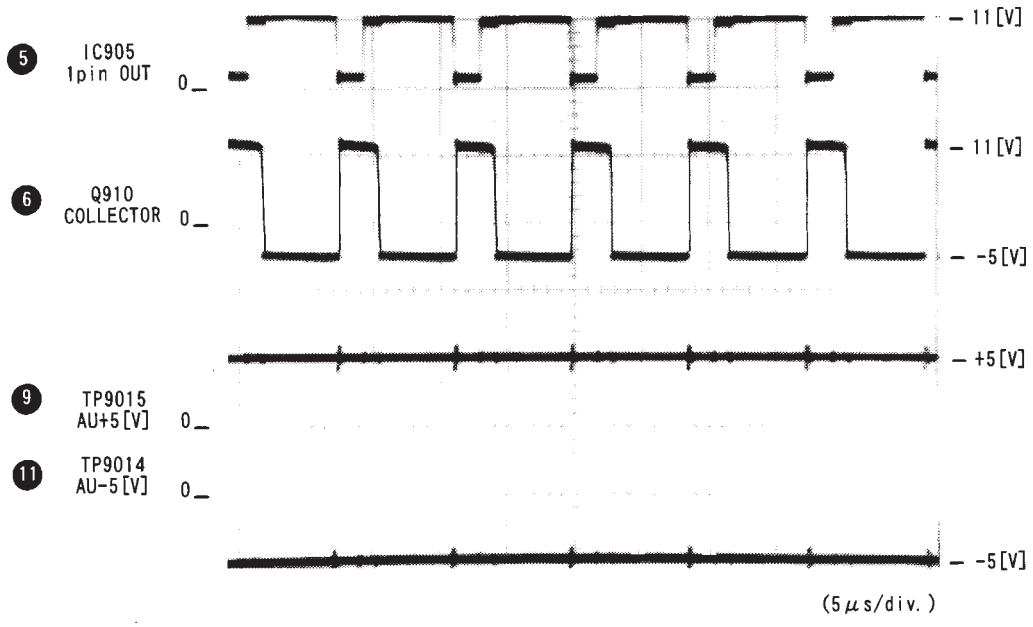


Fig. 3-9 AUDIO ±5 V power supply voltage generator circuit waveform timing chart

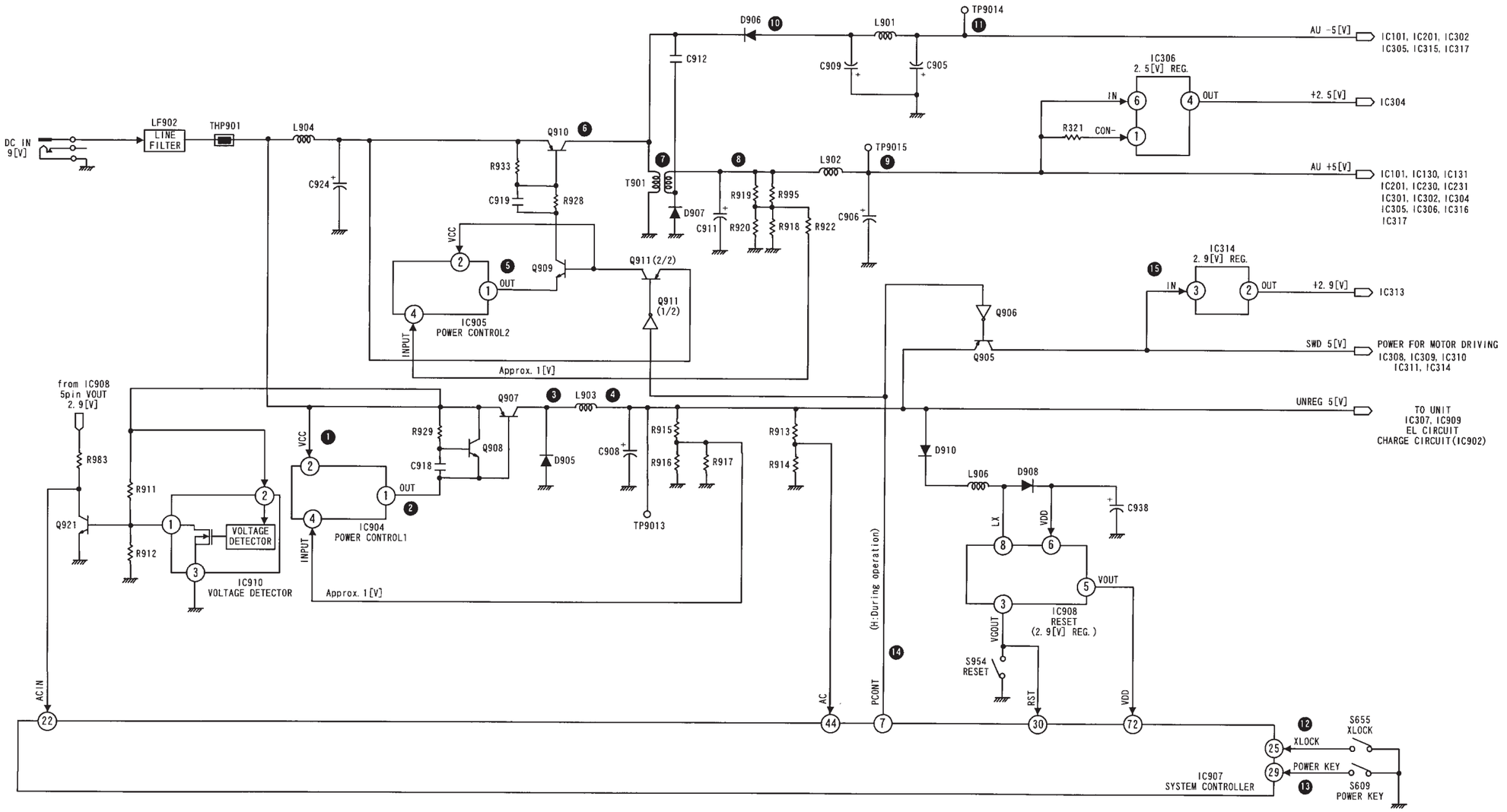


Fig. 3-4 Block diagram of the power supply circuit(MZS-R5ST)

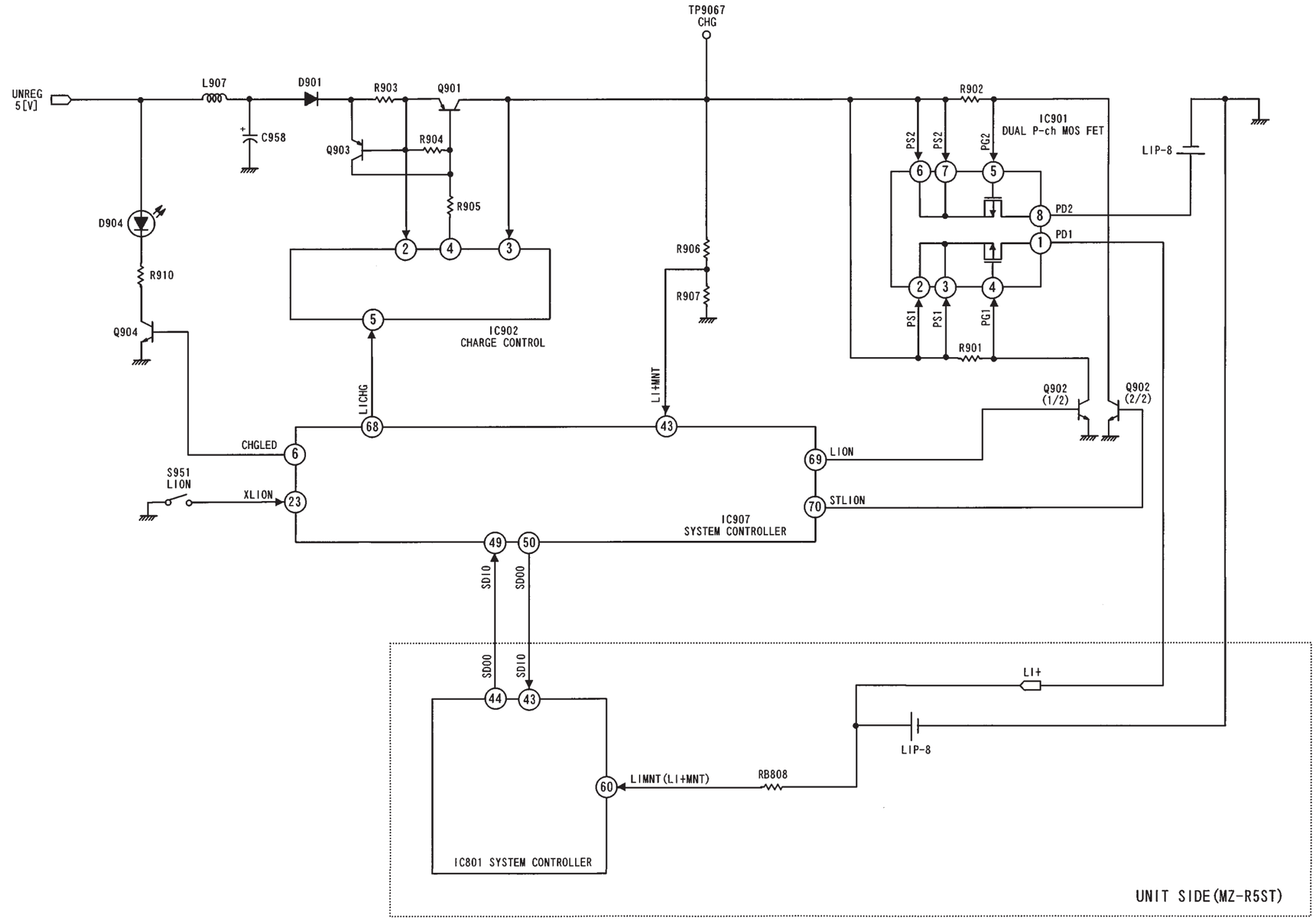


Fig. 3-10 Charging circuit

3-4. Charging Circuit

Fig. 3-10 shows the charging circuit. Charging operation starts when the following conditions are satisfied.

- ◆ When MiniDisc recorder is not connected to station : The main power is supplied to station and lithium-ion battery is connected.
- ◆ When MiniDisc recorder is connected to station : The main power is supplied to station and lithium-ion battery is connected either to MiniDisc recorder to station.

The charging operation when MiniDisc recorder is connected to station, is described first. When the main power is supplied to the station that is connected to the MiniDisc recorder, the respective system controller ICs of MiniDisc recorder and of station are activated. Then the system controller ICs of MiniDisc recorder and of station check presence and absence of rechargeable lithium-ion battery as shown in Table 3-1. Result of this check is sent from the system controller IC801 of MiniDisc recorder to that IC907 of station with the serial command. (This communication can be checked using the service mode installed this unit. Refer to service manual for more details.)

Table 3-1 Presence or absence of lithium-ion battery

	IC801 pin 60 [LIMNT (LI+MNT)]	IC907 pin 23 [XLION]
MiniDisc recorder	H	–
Station side	–	L

When the system controller IC907 detects that a lithium-ion battery is connected to either station or MiniDisc recorder, IC907 sets either pin 69 [LION] or pin 70 [STLION] whichever a battery is connected, to “H”. The P-channel MOS FET inside IC901 is turned “ON” by this “H” signal. Next, the system controller IC907 outputs “L” from its pin 68 [LICHG]. CHANGE CONTROL IC902 is started up by this “L” signal. When IC902 is started up, IC902 outputs “L” (approximately 3.6 V) from pin 4. Q903 and Q901 are turned “ON” by this “L” signal to start charging operation with constant current and constant voltage. The “LI+ voltage” that is output from Q901, is input to the dual P-channel MOS FET IC901 to supply the “LI+ voltage” (approximately 4.2 V) to the respective rechargeable lithium-ion batteries via P-channel MOS FET inside IC901.

Table 3-2 Supply of the “LI+ voltage”

Presence or absence of rechargeable lithium-ion battery	**IC907 pin 69 [LION]**	**IC907 pin 70 [STLION]**
MiniDisc recorder (MZ-R5ST) : Presence	H	–
MiniDisc recorder (MZ-R5ST) : Absence	L	–
Station side (MZS-R5ST) : Presence	–	H
Station side (MZS-R5ST) : Absence	–	L

IC902 detects the charging voltage (4.2 V) at its pin 3. IC902 controls the output voltage from its pin 4 using this feedback voltage.

The system controller IC907 outputs “H” from pin 6 [CHGLED] while charging the rechargeable lithium-ion battery connected to station. D904 is illuminated by this “H” signal.

3-5. System Backup Circuit

Fig. 3-11 shows the system backup circuit. Station (MZ-R5ST) adapted the built-in rechargeable Ni-Cd battery as shown in Fig. 3-11.

1. Charging circuit

When DC plug is connected to DC jack, the UNREG +5 V is generated and is sent to the 3.3 V regulator IC906 pin 3 [IN]. When the 3.3 V regulator IC906 is started up, 3.3 V is generated by the series regulator inside IC906 and is output from pin 2 [OUT]. The 3.3 V is supplied to rechargeable Ni-Cd battery as the charging voltage. It takes about 10 hours to fully charge a battery. This battery operates about one week as the power supply for TOC writing during timer recording even though AC power is kept disconnected.

2. Operation when system backup works

When DC plug is disconnected from DC jack, the P-channel MOS FET Q924 is turned on, and the output voltage from the rechargeable backup battery is supplied to the RESET IC908 pin 6 [VDD] via Q924. The RESET IC908 has the VDD power supply voltage detection circuit, and the IC908 controls the self-step-up circuit consisting of L906, D908, C938 and the switching output of pin 8 [LX] to maintain the VDD input voltage always above 3.4 [V]. When IC908 is started up, the MICON +B voltage 2.9 V is generated by the step-up/step-down regulator inside IC908. IC908 then outputs the generated 2.9 V from pin 5 [VOUT] to the system controller IC907 pin 72[VDD].
When the generated 2.9 V is supplied, the system controller IC907 keeps activated until the backup battery runs out even though DC IN 9V is not supplied. The output voltage of the rechargeable backup battery is supplied to MiniDisc recorder via D903 too. Then the system controller IC801 of MiniDisc recorder also starts up in the same manner as station. (Refer to section "5. MZ-R5ST MiniDisc RECORDER POWER SUPPLY CIRCUIT THEORY" for more details.) During the system backup mode, the system controller IC801 and REAL TIME CLOCK IC804 of MiniDisc recorder and the system controller IC907 of station are activated. The following data is kept memorized by the communication between the two system controller ICs.

- VOLUME setting data
- Clock setting data
- RESUME data, etc.

3. RESET operation

The RESET switch S954 is installed that allows manual reset because the system controller IC907 keeps activated until the backup battery runs out if it is started once. This RESET switch can be used to exit the service mode and for other purposes.

4. Power supply detection

Whether DC IN 9V is supplied or not is detected by pin 22 [ACIN] of IC907 because the system controller IC907 keeps activated until the backup battery runs out if it is started once. ("L": when DC IN 9V is supplied.) When DC IN 9V is supplied and pin 22 [ACIN] of system controller IC907 goes to "L" while the system backup power is also supplied, the status signal telling that DC IN 9V is supplied, is output from pin 50 [SD00] of IC907 to the system controller IC801 of MiniDisc recorder in the form of serial data. When IC801 receives the serial data, the reset operation is performed in the MiniDisc recorder.

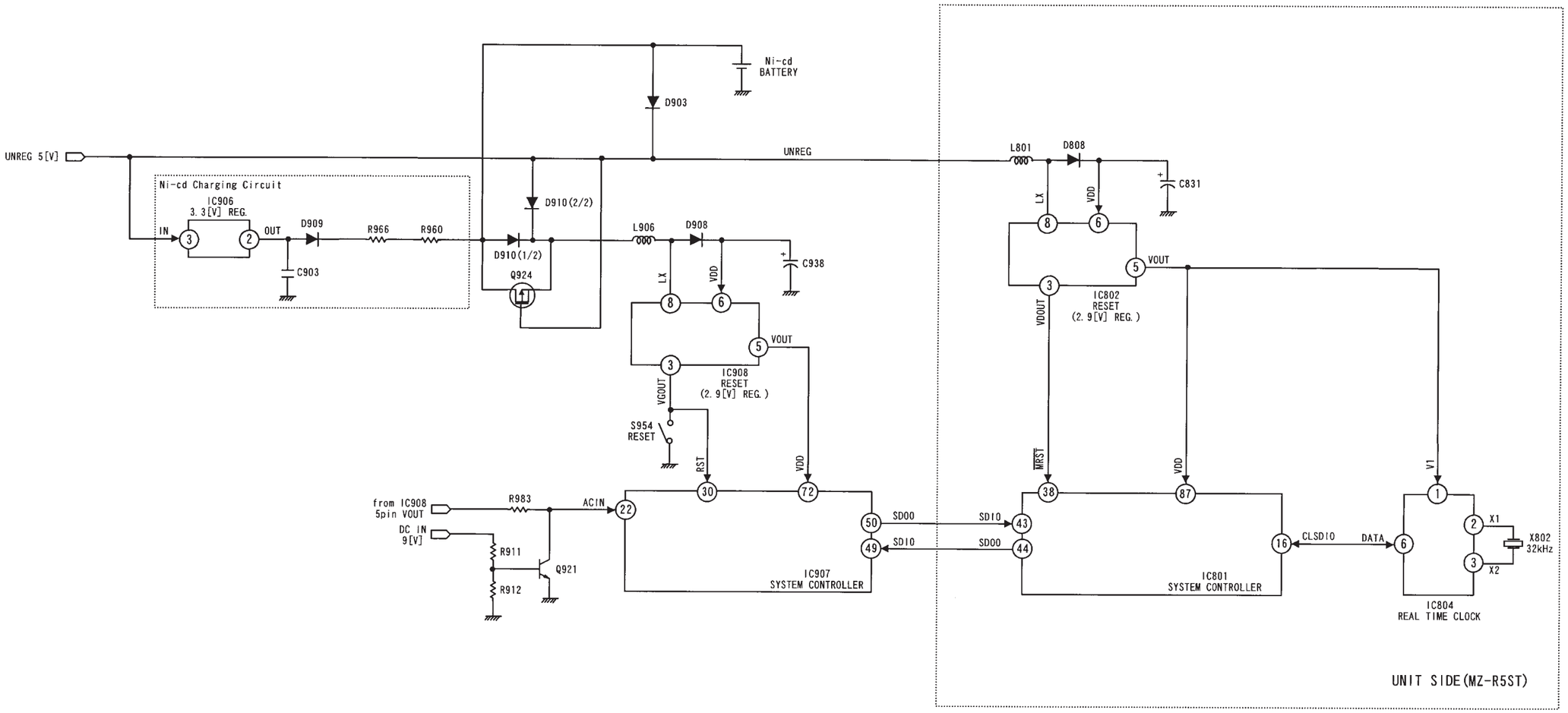


Fig. 3-11 System backup circuit

3-6. Key Input and Switch Detection

Fig. 3-12 shows block diagram of the key input and switch detection circuit of station. The system controller IC907 detects that any of the key switches is pressed, by performing detection shown in Table 3-3 through Table 3-8. Result of detection of the keys and switches that are shaded in these tables can also be checked when the service mode is used. Refer to service manual for more details.

Table 3-3 Detection switches

Switch No.	Switch Name	System control IC detect pin	Contents of Detection
S630	PANEL DOWN	Pin 63 [PANEL DOWN]	Detect whether panel of LCD is closed or not. (“L”: During PANEL DOWN)
S609	POWER	Pin 29 [POWER KEY]	POWER key detection switch
S610	PLAY KEY	Pin 26 [PLAY KEY]	PLAY key detection switch
S611	REC KEY	Pin 27 [REC KEY]	REC key detection switch
S612	LINE-OPT1-OPT2	Pin 74 [LINEOPT1] Pin 75 [LINOPT2]	Input sound source selector switch
S613	PLAY-OFF-REC	Pin 54 [TIMER1] Pin 55 [TIMER2]	Timer setting detection switch
S614	SYNCREC	Pin 76 [SYNCREC]	Synchro recording detection switch (“L”: When selecting synchro recording)
S951	XLION	Pin 23 [XLION]	Presence or absence of lithium battery of station (“L”: Presence)
S953	RELEASE	Pin 24 [XRELEASE]	RELEASE key detection switch
S952	CLOCK SET	Pin 28 [CLOCK KEY]	CLOCK SET key detection switch
S655	XLOCK	Pin 25 [XLOCK]	Whether MiniDisc recorder is fixed to station or not . (“L”: When MZ-R5ST is connected to station (MZS-R5ST))
S656	XINT	Pin 61 [XINIT]	Detect the initial position of MiniDisc. (“H”: When MZ-R5ST is connected to station (MZS-R5ST))

Table 3-4 List of KEY0 input voltage

Switch No.	Switch Name	13 IC907 pin 38 [KEYO]
S604	STOP	0 [V]
S605	REW	0.4 [V]
S606	FF	0.8 [V]
S607	PAUSE	1.2 [V]
S608	END.S	1.7 [V]

Table 3-5 List of KEY1 input voltage

Switch No.	Switch Name	IC907 pin 39 [KEY1]
S618	DISPLAY	0 [V]
S619	MODE	0.4 [V]
S620	UNDO	0.8 [V]
S621	TRACK MARK	1.2 [V]
S622	MOVE	1.7 [V]
S623	ERASE	2.1 [V]

Table 3-6 List of KEY2 input voltage

Switch No.	Switch Name	C907 pin 40 [KEY2]
S624	TITLE/ENTER	0 [V]
S625	SELECT	0.4 [V]
S626	CS+	0.8 [V]
S627	CS–	1.2 [V]
S628	UP	1.7 [V]
S629	DOWN	2.1 [V]

Table 3-7 List of KEY3 input voltage

Switch No.	Switch Name	IC907 pin 41 [KEY3]
S601	TREC	0 [V]
S602	VOL+	0.4 [V]
S603	VOL–	0.8 [V]

Table 3-8 List of KEY4 input voltage

Switch No.	Switch Name	IC907 pin 42 [KEY4]
S615	CAPS	0 [V]
S616	RIGHT	0.4 [V]
S617	LEFT	0.8 [V]

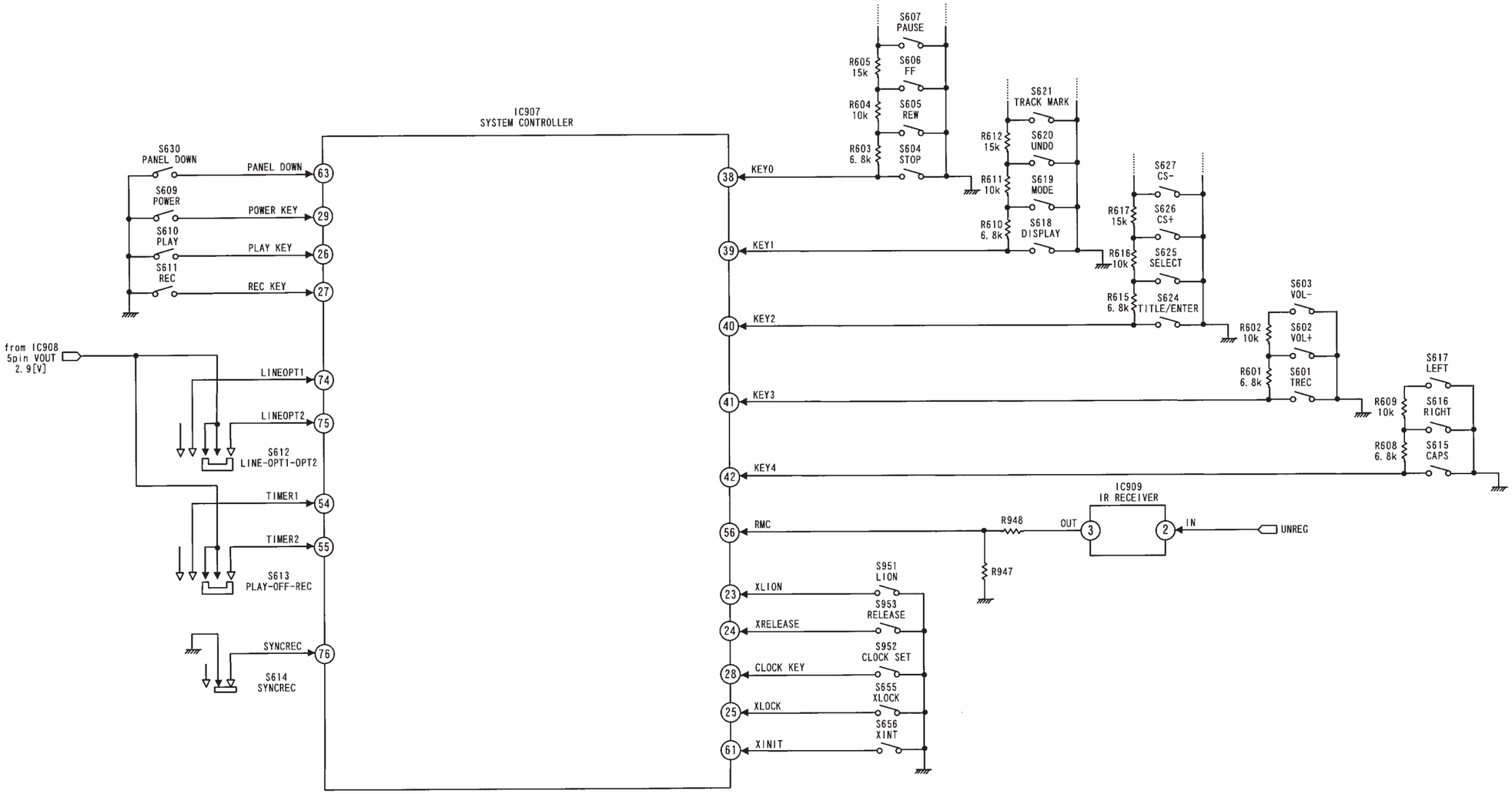
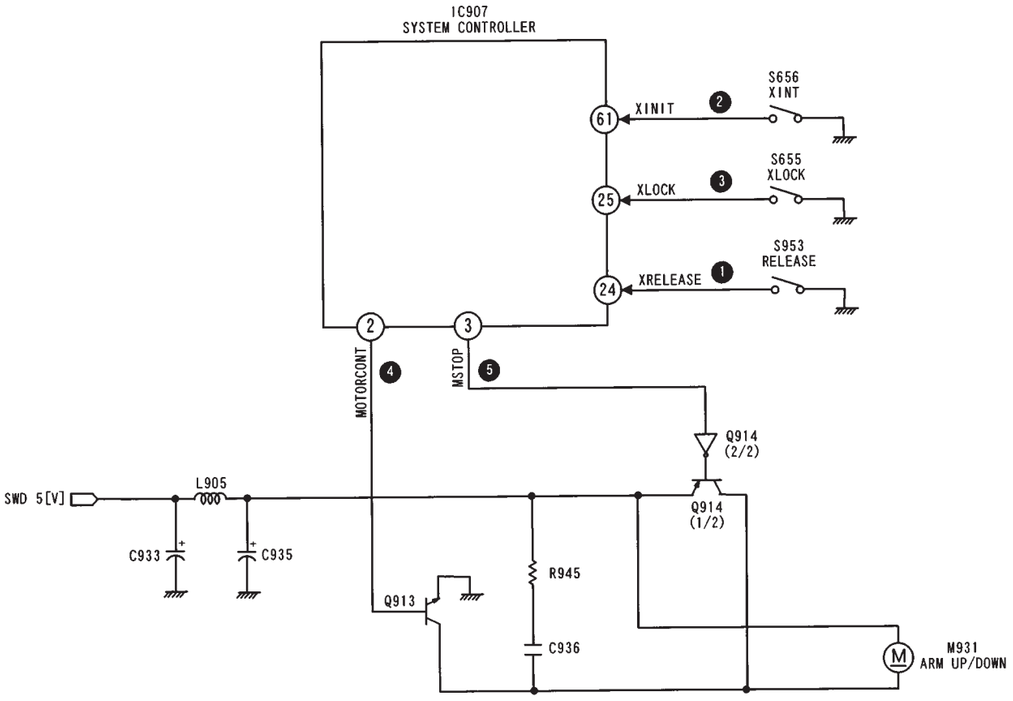
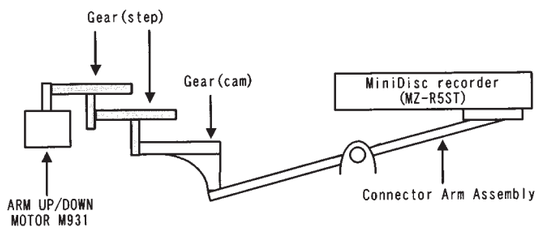
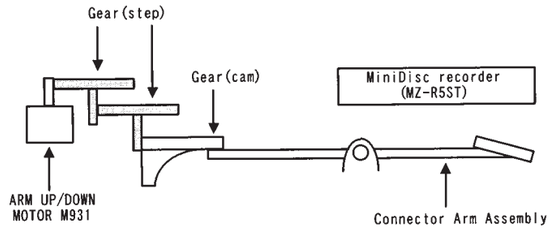


Fig. 3-12 Block diagram of the key input and switch detection circuit(MZS-R5ST)

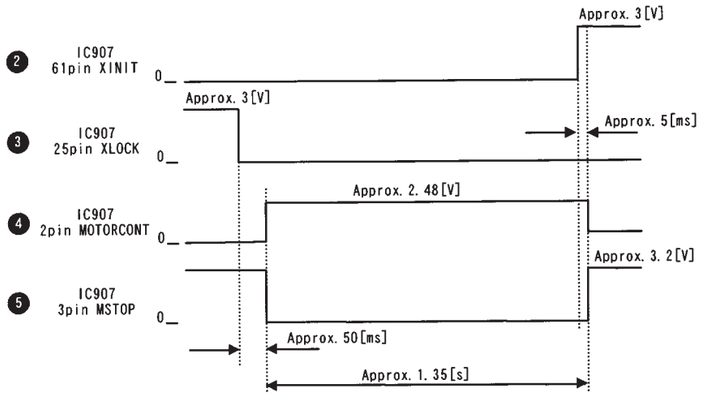




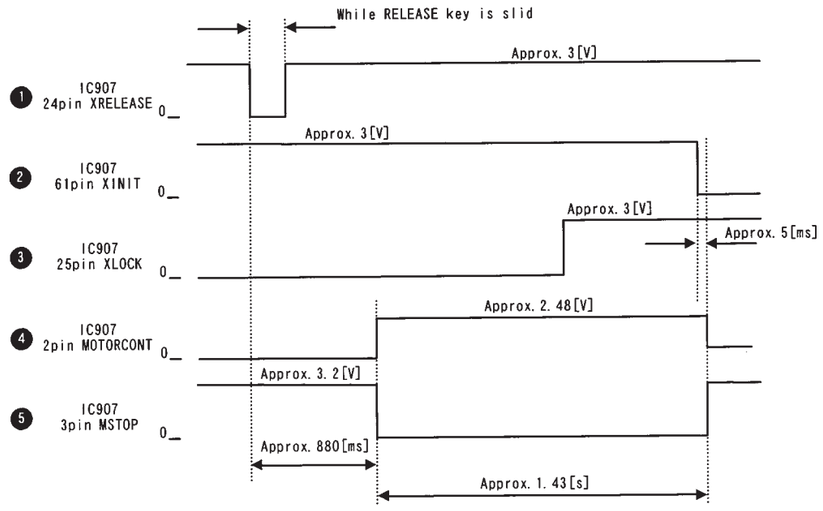
(a) Operation of mechanism when MiniDisc recorder is connected



(b) Operation of mechanism when MiniDisc recorder is removed



(c) When MiniDisc recorder is connected



(d) When MiniDisc recorder is removed

Fig. 3-13 Block diagrma of the MiniDisc recorder connection and removal

3-7. MiniDisc Recorder Connection and Removal

Fig. 3-13 shows the connection and removal circuit of MiniDisc recorder.

(1) Operation when MiniDisc recorder is connected to station

When MiniDisc recorder is connected to station, "L" single is input to pin 25 [XLOCK] of system controller IC907. When IC907 detects that "L" signal is input to Pin 25 [XLOCK], it outputs "H" from pin 2 [MOTORCONT] and "L" from pin 3 [MSTOP]. These output signals turn on Q913 and turn off Q914 (1/2) to start rotation of the arm up/down motor M931. As the arm up/down motor M931 rotates, the gear (step) and gear (cam) are driven by this motor rotation. The gear (cam) has protrusion. When MiniDisc recorder is connected to station, this gear (cam) overrides the connector arm assembly. (Refer to (a) in Fig. 3-13.) As the connector arm assembly overrides, the connector arm assembly moves upwards so that MiniDisc recorder is connected to station. At this state, XINT SW656 is set to the "un-pressed" state so that input to pin 61 [XINIT] of the system controller IC907 goes to "H". As the system controller IC907 detects that input to pin 61 [XINIT] goes to "H", it outputs "L" from pin 2 [MOTORCONT] and "H" from pin 3 [MSTOP] so that rotation of the arm up/down motor M931 is stopped.
Fig. 3-13 (c) shows the timing when MiniDisc recorder is connected to station.

(2) Operation when MiniDisc recorder is removed from station

When the RELEASE key is slid to right direction, input to pin 24 [XRELEASE] of the system controller IC907 goes to "L". When the "L" is input to pin 24 [XRELEASE], it outputs "H" from pin 2 [MOTORCONT] and "L" from pin 3 [MSTOP]. These output signals turn on Q913 and turn off Q914 (1/2) to start rotation of the arm up/down motor M931. As the arm up/down motor M931 rotates, the gear (step) and gear (cam) are driven by this motor rotation. The gear (cam) has protrusion. When MiniDisc recorder is removed from station, this gear (cam) removes the connector arm assembly. (Refer to (b) in Fig. 3-13.) As the connector arm assembly is removed, the connector arm assembly moves downwards so that MiniDisc recorder is disconnected from station. At this state, XINT SW656 is set to the "pressed" state so that input to pin 61 [XINIT] of the system controller IC907 goes to "L". As the system controller IC907 detects that input to pin 61 [XINIT] goes to "L", it outputs "L" from pin 2 [MOTORCONT] and "H" from pin 3 [MSTOP] so that rotation of the arm up/down motor M931 is stopped.
Fig. 3-13 (d) shows the timing when MiniDisc recorder is removed from station.

3-8. Mute Circuit

Fig. 3-14 shows block diagram of the mute circuit (MZS-R5ST). The mute circuit is activated when any of the following three conditions is satisfied.

■ Conditions

① When any key such as STOP/ PAUSE / FF is operated (Mute control by pin 93 [AMUTE] of the system controller IC801 of MiniDisc recorder)

② When MiniDisc recorder is removed and when station is used as a stand-alone unit (Mute control by pin 71 [PMUTE] of the system controller IC907 of station)

③ When DC plug is removed from station (Mute control by the voltage detector IC316)

The mute circuit operation under the respective conditions is described respectively. Because the L-channel and the R-channel use the same circuit configuration, only the flow of L-channel signal is described below.

(1) Mute circuit operation under the above described condition ①

When MiniDisc recorder is connected to station, and when any function button such as STOP or FF button requiring the mute operation, is pressed, "H" is output from pin 93 AMUTE] of the system controller IC801. Q301 and Q302 are turned "ON" by this "H" signal, and AUDIO +5 V is supplied to Q101 to Q103 so that the respective output signals are muted.

(2) Mute circuit operation under the above described condition ②

When MiniDisc recorder is removed or when station is used as a stand-alone unit, "H" is output from pin 71 [PMUTE] of the system controller IC907. The mute circuit functions in the same way as described in the above condition ①. Also as Q304 and Q303 are turned "ON" by this "H" signal, AUDIO +5 V is supplied to Q104. And the input side of the headphones amplifier IC305 is muted too.

(3) Mute circuit operation under the above described condition ③

When DC plug is removed from station, input to pin 3 of the voltage detector IC316 goes to "L". IC316 has the built-in power supply voltage detection circuit so that it outputs "H" when the input to its pin 3 becomes lower than 4.5 V. This "H" signal turns on the next stage N-channel MOS FET so that the pin 1 potential goes to "L" which turns on Q302 to activate the mute circuit.

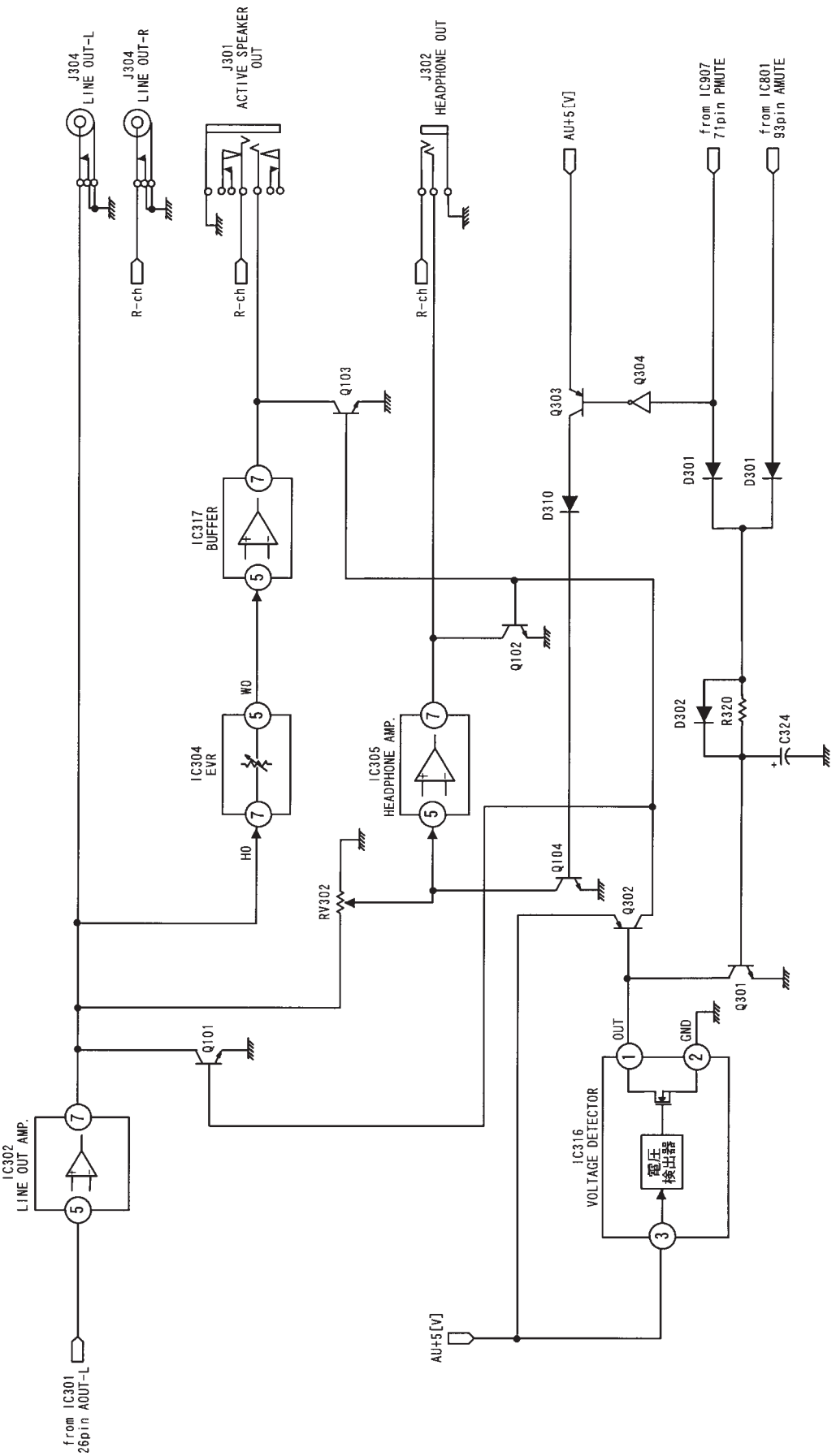


Fig. 3-14 Block diagram of the MUTE circuit (MZS-R5ST)

3-9. LCD Backlight Illuminating Circuit

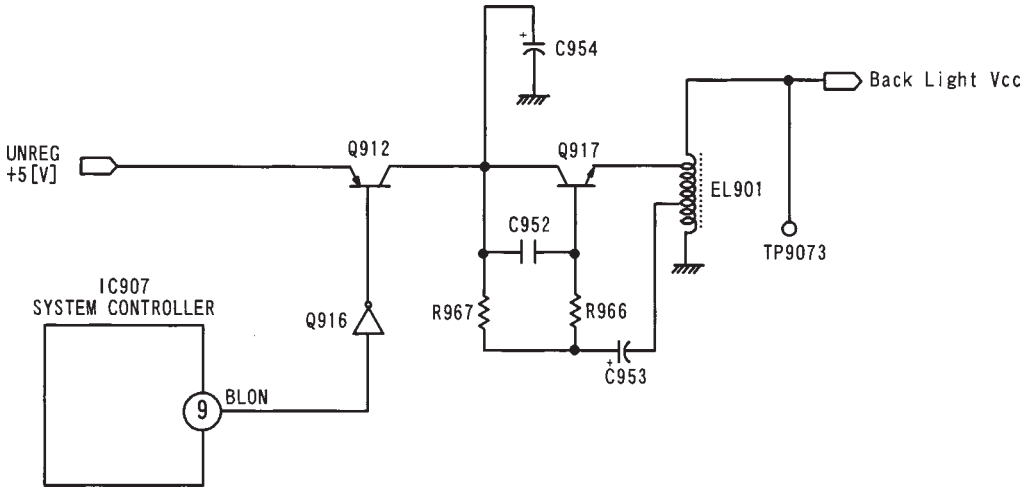


Fig. 3-15 Block diagram of the LCD backlight illuminating circuit

Fig. 3-15 shows the block diagram of the LCD backlight illuminating circuit. When the LCD backlight is turned on, "H" is output from the system controller IC907 pin 9 [BLON]. This "H" signal turns on Q916, Q912 and Q917 so that the UNREG +5 V is supplied to EL901. Then high frequency signal is generated by the transformer EL901 and supplied to the EL element of the LCD block so that the EL element illuminates.

Oscillating waveform during normal operation is shown in Fig. 3-16.

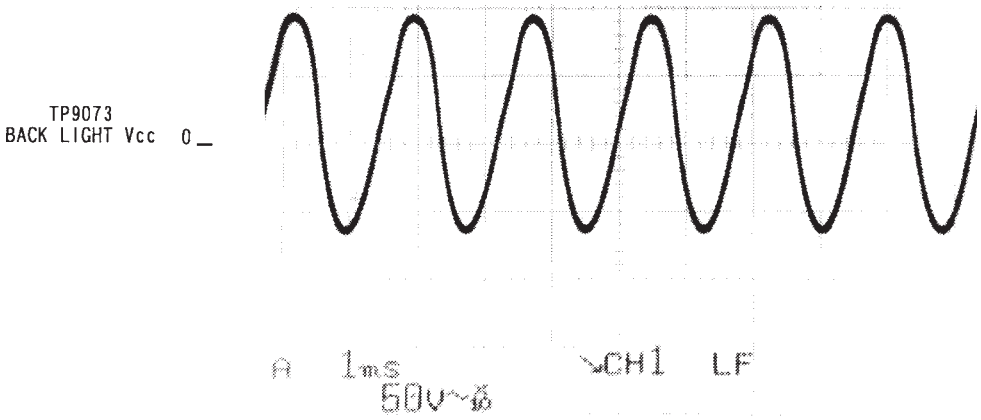


Fig. 3-16 Oscillating waveform during normal operation

3-10. Clock Adjustment

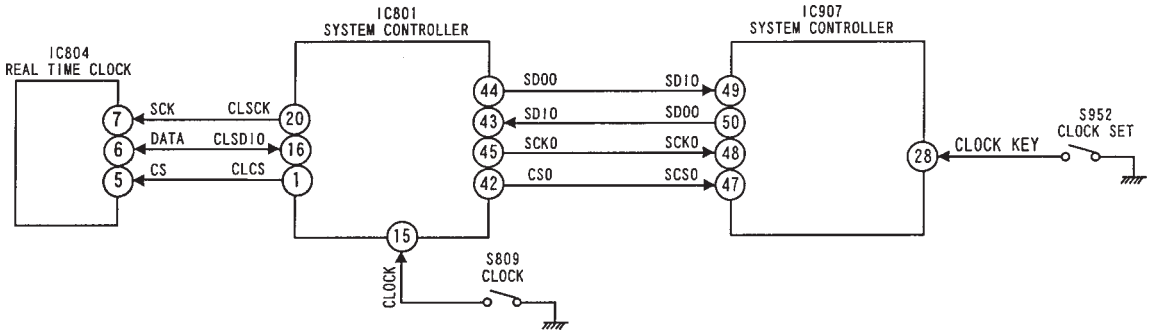


Fig. 3-17 Block diagram of clock adjustment

Fig. 3-17 shows block diagram of clock adjustment.

(1) Operation when MiniDisc recorder is connected to station

When the CLOCK SET switch S952 is pressed, input to the system controller IC907 pin 28 [CLOCK KEY] goes to "L". IC907 detects that the CLOCK SET switch is pressed and at the same time establishes communication with the system controller IC801 of MiniDisc recorder so that the clock setting data is output to IC801. When IC801 receives the clock setting data, it sends the clock setting data from pin 16 [CLSDIO] to the real time clock IC804 in synchronization with the clock at pin 20 [CLSCK] and the chip select signal at pin 1 [CLCS]. Thus clock adjustment is performed.

(2) Operation when MiniDisc recorder is used as a stand-alone unit

When the CLOCK switch S908 is pressed, input to the system controller IC801 pin 15 [CLOCK] of MiniDisc recorder goes to "L". IC801 detects that the CLOCK switch is pressed and at the same time it sends the clock setting data from pin 16 [CLSDIO] to the real time clock IC804 in synchronization with the clock at pin 20 [CLSCK] and the chip select signal at pin 1 [CLCS]. Thus clock adjustment is performed.

(3) Operation after time is set

When MiniDisc recorder is started its operation, the system controller IC801 output the read-out command from pin 16 [CLSDIO] to the real time clock IC804 in synchronization with the clock at pin 20 [CLSCK] and the chip select signal at pin 1 [CLCS]. When the real time clock IC804 receives the read-out command, it sends the clock data to the system controller IC801 in synchronization with the clock at pin 20 [CLSCK] and the chip select signal at pin 1 [CLCS] in the same manner as the data write mode. When the system controller IC801 receives the time information, it sends the time information to the system controller IC907 in synchronization with the clock that is output from pin 45 [SCK0]. Thus the respective ICs receive the time information.

4. SIGNAL CIRCUIT

The signal circuit of this unit is almost same as that of the 4th generation MiniDisc recorder MZ-R30. Therefore, only the following items are described in this manual.

- Recording circuit → The signal path up to the input stage of the DSP IC503 is described.
- Playback circuit → The signal (DA data) path after the playback signal is output from the DSP IC503 is described.

Refer to "NEW TECHNICAL THEORY FOR SERVICING, MZ-R30, OPERATION MANUAL (9-923-089-31)" for the description of the signal processing of DSP IC503 and for the description of servo circuit.

4-1. Recording Circuit

1. Operation (of DIGITAL IN/OUT circuit) during digital recording

Fig. 4-1 shows block diagram of the DIGITAL IN/OUT circuit.

(1) Selection of recording source

This unit has the two digital inputs. The recording source selector switch S612 is installed in station. Selection information of this switch is sent to the system controller IC907 pin 74 [LINEOPT1] and pin 75 [LINEOPT2]. The system controller IC907 identifies the recording source by recognizing the input as shown in Table. 4-1.

Table 4-1 Recording source selector switch S612

Recording source selector switch S612	IC907 pin 74 [LINEOPT1]	IC9O7 pin 75 [LINEOPT2]	IC907 pin 11 [OPT]
Line	L	L	L
OPT1	H	L	H
OPT2	L	H	L

(2) DIN SELECTOR IC311

During digital recording, the respective digital data of each input source is input to the DIN SELECTOR IC311 pin 13 [4B] and pin 14 [4A]. Then the system controller IC907 outputs the control signal ("H": when DIN1 is selected) from pin 11 [OPT], based on the result of selection of the recording source selector switch S612. The output signal from IC907 pin 46 [BUF EN] is the start-up switch signal ("L": during starting up IC307) of the level converter 3 V to 5 V IC307.

(3) Level converter 5 V to 3 V IC313

The digital input data selected by the DIN selector IC311 is sent to the level converter 5 V to 3 V IC313. IC313 has the function to convert the signal having 5 V amplitude is converted to the signal having 3 V amplitude (exactly speaking 2.9 V amplitude) because the DSP IC503 of MiniDisc recording operates on 2.8 V. After the signal level conversion, IC313 outputs the digital data from pin 3 [1Y] to the DSP IC503 pin 21 [DIN] of MiniDisc recorder where signal processing for recording is performed. The output signal from the system controller IC907 pin 10 [OPT EN] is the start-up switch signal of the level converter inside the level converter 5 V to 3 V IC313. "L" is output from the system controller IC907 pin 10 [OPT EN] when the following conditions are satisfied.

◆ Conditions : When result of selection of the recording source selector switch S612 is either OPT1 or OPT2, and when mode of MiniDisc recorder is either REC or REC PAUSE.

(4) Operation of the digital output circuit

Firstly, the digital data that is bi-phase mark modulated inside the DSP IC503, is output from pin 22 [DOUT] to the level converter of 3 V to 5 V IC307. IC307 converts the input signal having 2.8 V amplitude to the signal having 5 V amplitude that is output from pin 6 [A5] to the DOUT terminal.

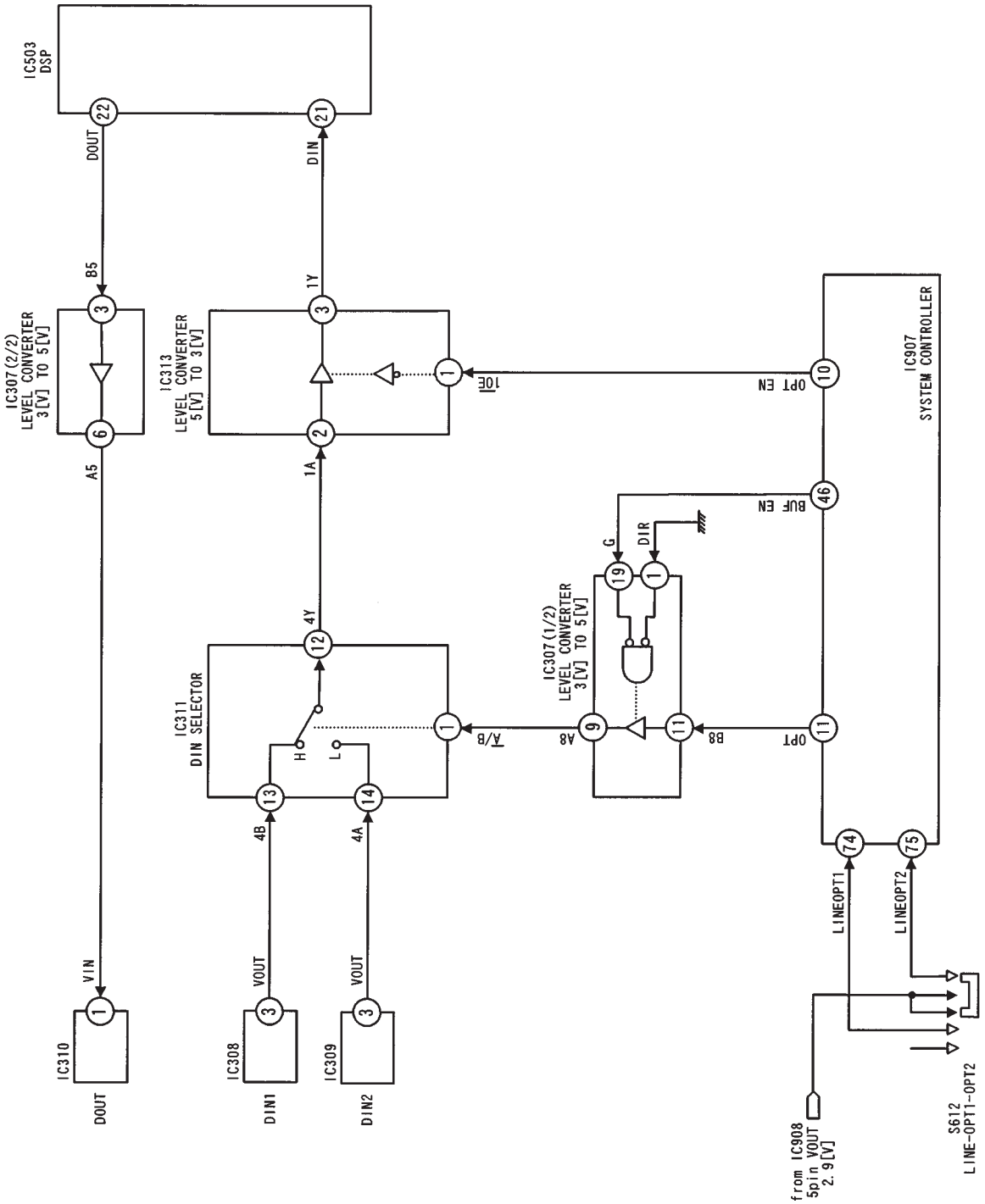


Fig. 4-1 Block diagram of the DIGITAL IN/OUT circuit

2. Operation during LINE recording

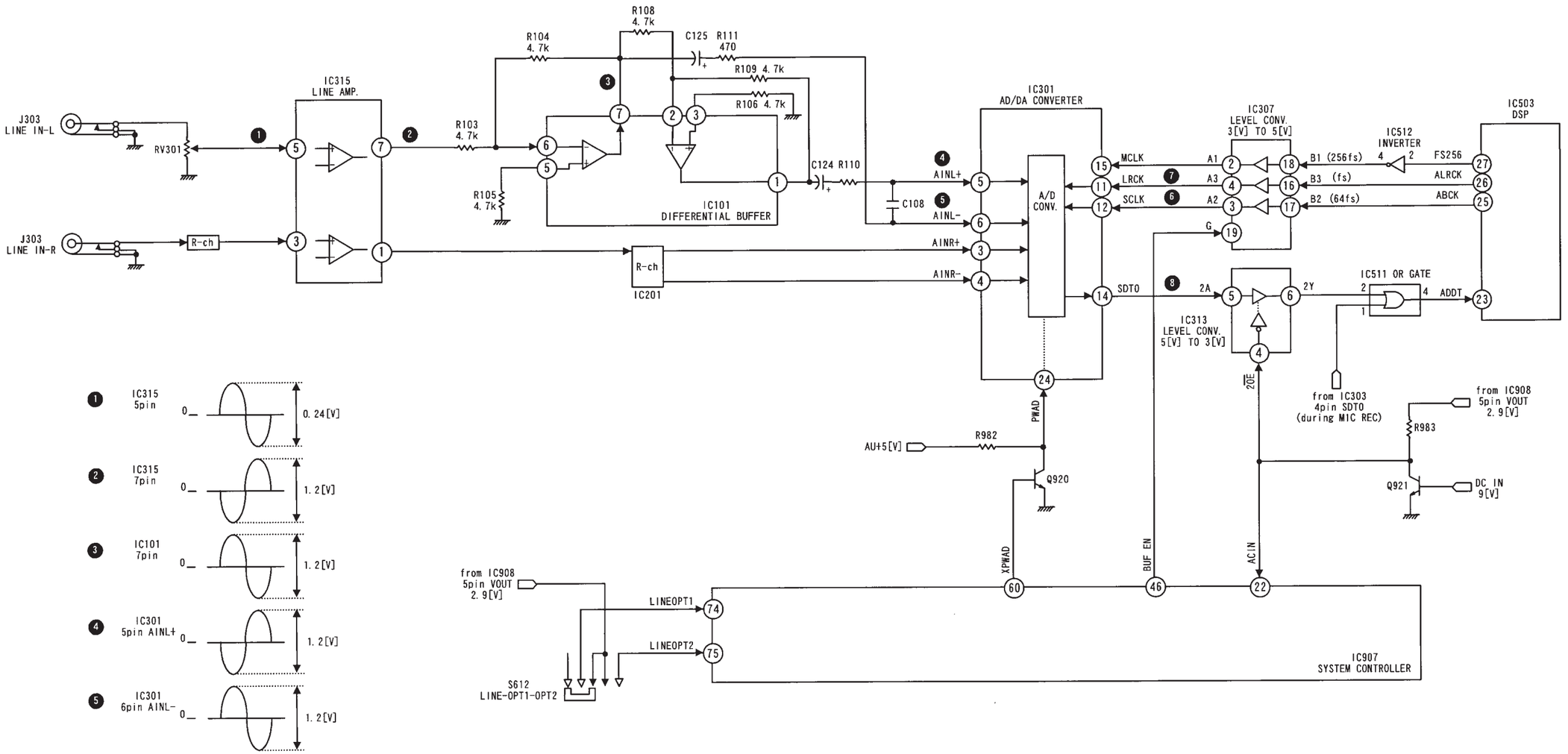
Fig. 4-2 shows block diagram of the recording circuit during LINE recording. Because the L-channel and the R-channel use the same circuit configuration, only the L-channel is described below. This unit is equipped with the differential conversion circuit at the LINE input in order to realize the same high quality sound as that of deck-type MiniDisc recorder. The differential conversion circuit improves the resolution ability when signal is A/D converted inside the AD/DA converter IC301.

When LINE is selected by the input source selector switch S612, input of the system controller IC907 pin 74 [LINEOPT1] and pin 75 [LINEOPT2] go to "L", and IC907 recognizes that the input source is analog (LINE). When MiniDisc recorder enter the REC mode or the REC PAUSE mode, IC907 output "L" signal from pin 60 [XPWAD]. Q920 is turned "OFF" by this "L" signal so that "H" is input to the AD/DA converter IC301 pin 24 [PWAD] so that the A/D converter inside IC301 is started up.

The L-channel signal flow during the LINE recording is described next. The L-channel analog signal that is input from the LINE IN jack J303 passes through the LINE amplifier IC315, the differential buffer IC101 and is sent to the AD/DA converter IC301 pin 5 [AINL+] and pin 6 [AINL–], then to the A/D converter inside IC301 where the input analog signal is converted to the 20-bit digital data. The generated digital data is output to the DSP IC503 alternately via the level converter IC313 and OR gate IC511 in synchronization with the LRCK (L-channel/R-channel discrimination signal) and BCK (bit clock).
The level converter IC313 has the function to convert the signal having 5 V amplitude is converted to the signal having 3 V amplitude (exactly speaking 2.9 V amplitude) because the DSP IC503 of MiniDisc recording operates on 2.8 V. During LINE recording, Q921 is turned on by the DC IN 9 V that is supplied to station so that the input to IC313 pin 4 [2$\overline{OE}$] is set to "L". This "L" signal activates the level converter circuit inside IC313.

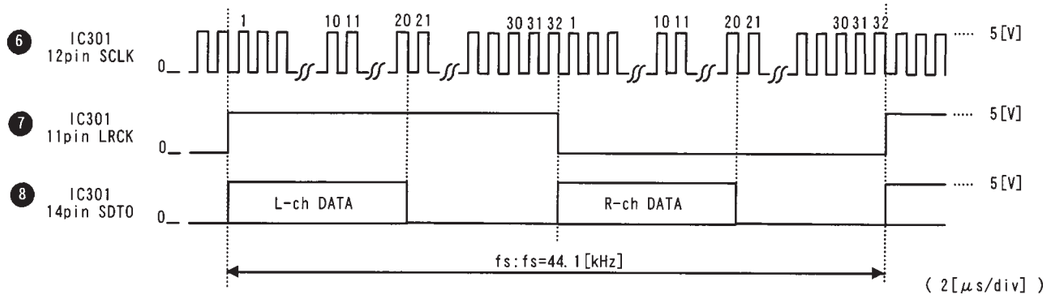
Fig. 4-2 (a) shows the waveform timing chart when the following conditions are satisfied. Fig. 4-3 shows the waveform timing of IC301 output side.

- ◆ Input sound source: 1 kHz, 0 dB signal
- ◆ Recording level : Adjusted around –2 dB by the REC volume.

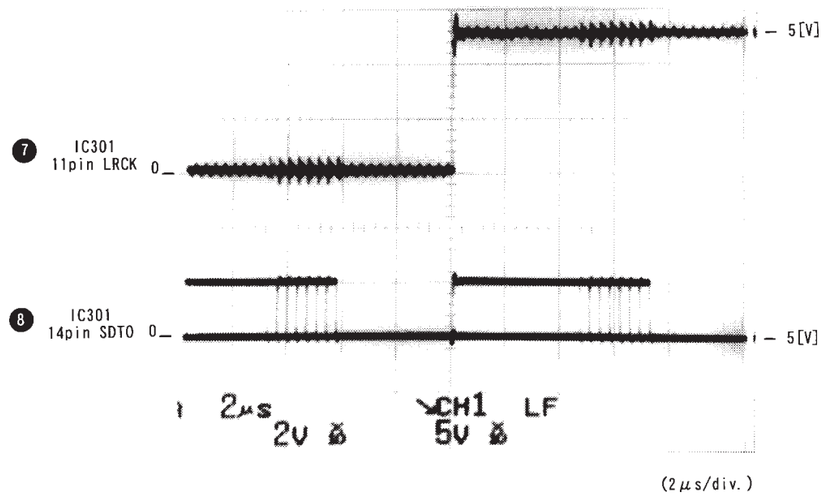


(a) Waveform timing chart when input signal is 1kHz, 0dB

Fig. 4-2 Block diagram of the recording circuit during LINE recording



(a) Waveform timing of IC301 output side



(b) Waveform timing example of IC301 output side

Fig. 4-3 Waveform timing of IC301 output side

3. Operation during MIC recording

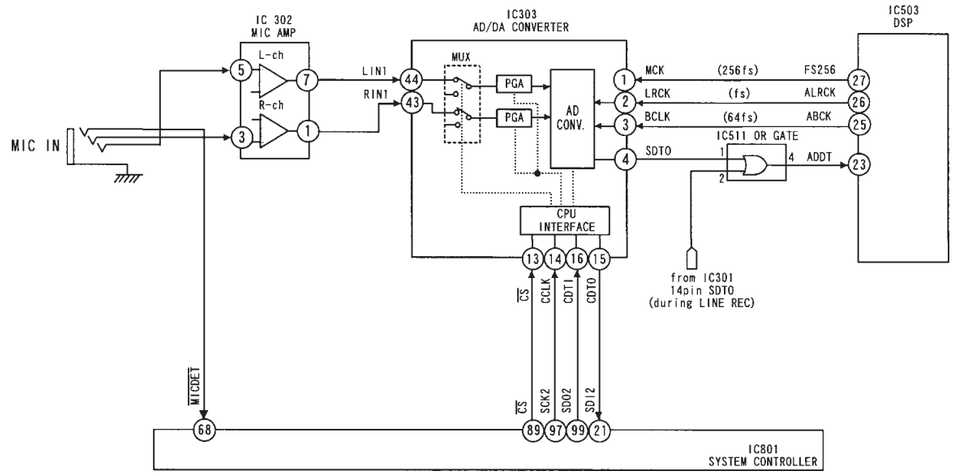


Fig. 4-4 Block diagram of the recording circuit during MIC recording

Fig. 4-4 shows the block diagram of the recording circuit during MIC recording.

The analog signal that is input from the MIC IN jack is amplified by the microphone amplifier IC302 and input to the AD/DA converter IC303 pin 44 [LIN1] and pin 43 [RIN1]. The input analog signal is amplified by PGA (Programmable Gain Amplifier) inside IC303, then input to A/D converter in IC303 where the input analog signal is converted to the 16-bit digital data. The generated digital data is output to the DSP IC503 alternately in synchronization with the LRCK (L-channel/R-channel discrimination signal) and BCK (bit clock).
In the AD/DA converter IC303, the intemal multiplexer receives the serial command (input source selection command and others) from the system controller IC801 pin 99 [SD02] and selects the input source. Because MiniDisc recorder uses the A/D converter inside the AD/DA converter IC303 only during MIC recording, IN1 is always selected as the input source. The AD/DA converter IC303 has the built-in PGA (Programmable Gain Amplifier) which is used to enable either AUTO gain mode recording or MANUAL gain mode recording during MIC recording. PGA adjusts the MIC gain by means of software during the AUTO mode, and adjusts the MIC gain in accordance with the value set by user during the MANUAL mode.

The MIC recording is possible when MiniDisc recorder is operated without station. When MiniDisc recorder is connected to station (MZS-R5ST), the MIC recording is not possible.

4-2. Playback Circuit

(1) Basic configuration of playback circuit

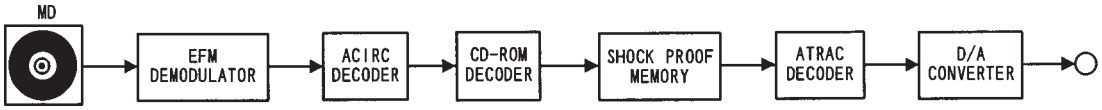


Fig. 4-5 Playback circuit basic block diagram

Fig. 4-5 shows the playback circuit basic block diagram of MiniDisc system. The RF data that is read by the optical block is EFM-demodulated by the EFM demodulator, and is performed the error detection and error correction by the ACIRC decoder. Because the MiniDisc data has the same data structure as that of CD-ROM format, the RF signal is decoded by the CD-ROM decoder. Then the ATRAC data that is obtained by decoding has already compressed into 1/5 of original data, and is stored once in the shock proof memory (buffer RAM). This memory stores not only the ATRAC data but also the error information (C2PO) and TOC/UTOC information too. Next, the ATRAC data that is periodically read out from the shock proof memory, is expanded to the 16-bit or 20-bit linear data by the next stage ATRAC decoder. The ATRAC data is then converted to analog signal by the next stage D/A converter.

(2) Playback circuit

Fig. 4-6 shows block diagram of the playback circuit, when MiniDisc recorder is connected to station. The DA data that is output from the DSP IC503 of MiniDisc recorder is sent to the AD/DA converter IC301 via the level converter 3 V to 5 V IC 307. The DA data is converted to the L-channel and R-channel analog signal by D/A converter located inside IC301. The output analog signal is sent to the LINE OUT jack J304 via the LINE OUT amplifier IC302, and is sent to the HEADPHONES OUT jack J302 via the LINE OUT amplifier IC302, the PB VOLUME RV302 and headphone amplifier IC305. It is also output to the ACTIVE SPEAKER OUT jack J301 via the LINE OUT amplifier IC302, EVR IC304 and buffer IC317.

Regarding the signal output to MiniDisc recorder (MZ-R5ST), signal flow of L-channel signal only is described below. When MiniDisc recorder is connected to station, you can listen to sound from the HEADPHONES output of MiniDisc recorder. The headphone output signal is created as follows. The analog signal that is output from the AD/DA converter IC301 is sent to the audio gain amplifier IC305 via differential amplifier consisting of IC330, IC130 and IC131. After the audio volume is controlled by the audio gain control IC305 and by the communication with the system controller IC801, the audio signal is output from the HEADPHONES OUT jack J302 via the headphone amplifier IC805.

(3) System controller IC907

It controls the output signal during playback as shown in Table 4-2.

Table 4-2 Control signals during playback

	IC9O7 pin 46 [BUF EN]	IC907 pin 80 [XPWDA]	IC9O7 pin 1 [DEEMP]	IC9O7 pin 78 [DIFO]	IC907 pin 79 [DIF1]
H	IC307 during STOP	D/A converter during STOP	De-emphasis during OFF	–	When the main power is ON
L	IC 307 during START	D/A Converter during START	De-emphasis during ON	Constant “L”	When the main power is OFF

When MiniDisc system is operated, the system controller IC907 outputs “L” from pin 78 [DIF0] and “H” from pin 79 [DIF1]. These output signals are the control signal for the audio serial interface format to be used inside the AD/DA converter IC301. When these signals are sent, IC301 selects the operating mode that is specified in accordance with the input signals at pin 9 [DIF0] and pin 10 [DIF1]. In this unit, MODE1 is always selected.

Table 4-3 List of audio serial interface mode

MODE	IC301 pin 9 [DIF0]	IC301 pin 10 [DIF0]	SDTO (A/D converter)	SDTI (D/A converter)	L/R
0	L	L	20-bit, MSB, justified	16-bit, LSB, justified	H/L
1	H	L	20-bit, MSB, justified	20-bit, LSB, justified	H/L
2	L	H	20-bit, MSB, justified	20-bit, MSB, justified	H/L

When the system controller IC907 detects that the active speaker VOLUME key is pressed at pin 41 [KEY3], IC907 outputs data from pin 67 [EDATA] to EVR IC304 in synchronization with the clock at pin 65 [ESCK] and the chip select signal at pin 66 [ECS]. Output data from IC907 controls the output signal from ACTIVE SPEAKER OUT J301.

Fig. 4-7 shows the waveform timing chart of IC301 input side.

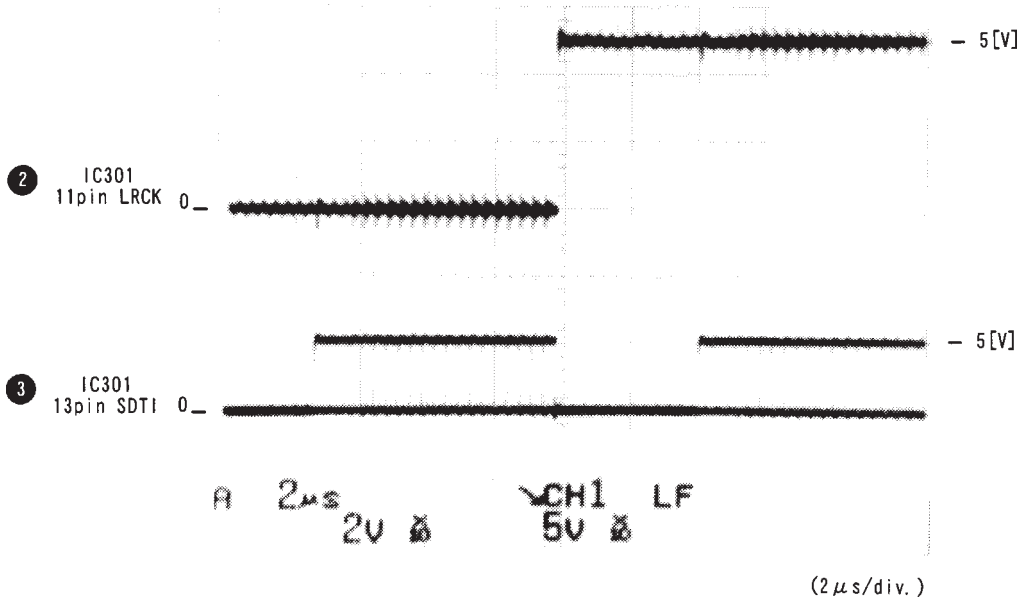
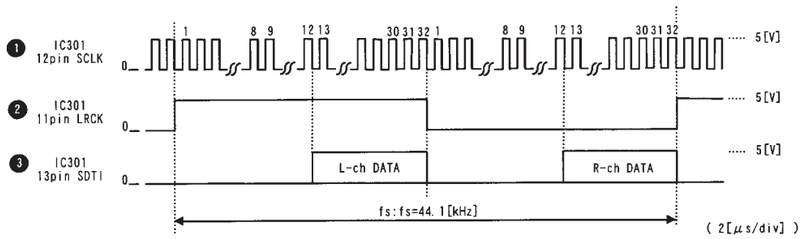


Fig. 4-7 Waveform timing chart of IC301 input side

◆ Technical tip ◆
When the WALKMAN (MiniDisc recorder MZ-R5ST) is played back as a stand-alone unit, the DBB function that is installed the WALKMAN can be used. However, when WALKMAN is connected to station, the DBB function is disabled.



(a) Waveform timing of IC301 input side

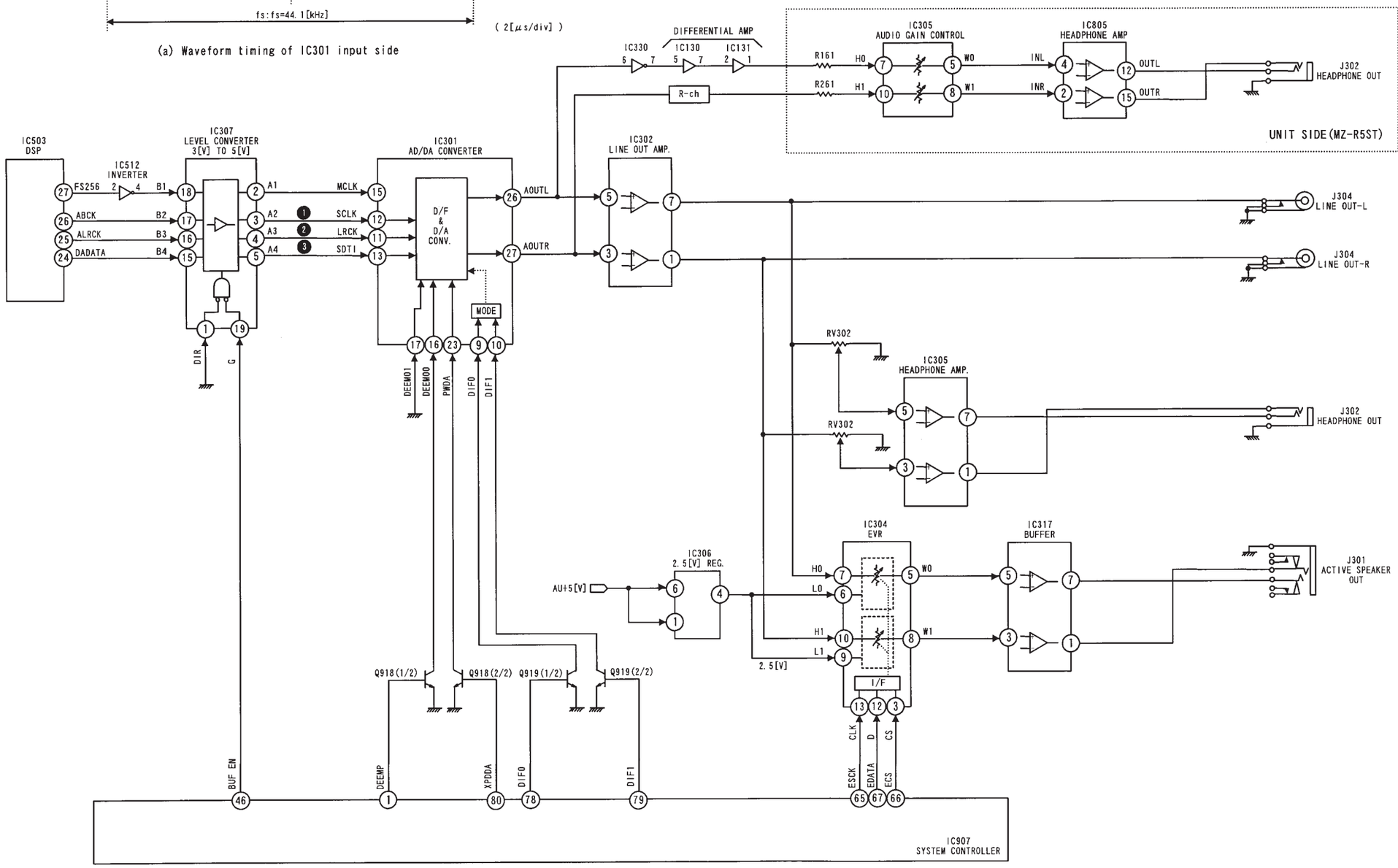


Fig. 4-6 Block diagram of the playback circuit

5. MZ-R5ST MINIDISC RECORDER POWER SUPPLY CIRCUIT THEORY

5-1. Types of Power Supply

MiniDisc recorder can be operated on the four kinds of power supply as shown below.

◆ When MiniDisc recorder is connected to station:
- AC adapter ..... 9.0 V (supplied)

◆ When MiniDisc recorder is used as a stand-alone unit:
- Rechargeable lithium-ion battery (LIP-8) ..... 3.7 V (supplied)
- Dry cell battery (size AA, 2 pcs) ..... 3.0 V (optional)
- Rechargeable nickel-hydrogen battery (BP-DM20) ..... 2.4 V (optional)

Table 5-1 shows the operating hours of each type of battery.

Table 5-1 Comparison of battery operating hours (MZ-R30, MZ-R5ST)

No.	Battery	MZ-R30		MZ-R5ST	
		During recording	During playback	During recording	During playback
1.	Rechargeable lithium-ion battery (LIP-12 (H))	For about 5 hours	For about 8 hours	–	–
2.	Rechargeable lithium-ion battery (LIP-8)	–	–	For about 3.5 hours	For about 5.5 hours
3.	SONY alkaline dry cell (LR6 (size AA) 2 dry cells)	For about 3 hours	For about 6.5 hours	For about 4.5 hours	For about 9 hours
4.	Rechargeable nickel-hydrogen battery (BP-DM20)	For about 3 hours	For about 4.5 hours	For about 4.5 hours	For about 6.5 hours
5.	1+3	For about 8.5 hours	For about 15 hours	–	–
6.	2+3	–	–	For about 8 hours	For about 16 hours
7.	1+4	For about 8.5 hours	For about 14.5 hours	–	–
8.	2+4	–	–	For about 8 hours	For about 13 hours

5-2. Identifying Power Supply

The system controller IC801 identifies from which the main power is supplied, immediately after it is started up. When any battery outside the specifications is used, it stops operation of MiniDisc recorder. The system controller IC801 identifies the type of power supplies from the result of the three kinds of detection.

(1) Pin 27 $\overline{\text{[DCIN]}}$: When MZ-R5ST is connected to station, it goes to “L”.
(2) Pin 60 [LIMNT (LI + MNT)] : The voltage that is obtained by voltage-dividing-resistor of the lithium-ion battery output voltage.
(3) Pin 53 [AM3] : The voltage that is obtained by voltage-dividing-resistor of the dry cell or nickel-hydrogen battery output voltage.

Table 5-2 List of power supply identification

	Pin 27 $\overline{\text{[DCIN]}}$	Pin 60 [LIMNT]	Pin 53 [AM3]
When MZ-R5ST is connected to station	L	L	L
When MZ-R5ST is operated on rechargeable lithium-ion battery	H	H	L
When MZ-R5ST is operated on rechargeable nickel-hydrogen battery	H	L	H
When MZ-R5ST is operated on alkaline dry cell	H	L	H

5-3. Circuit voltage

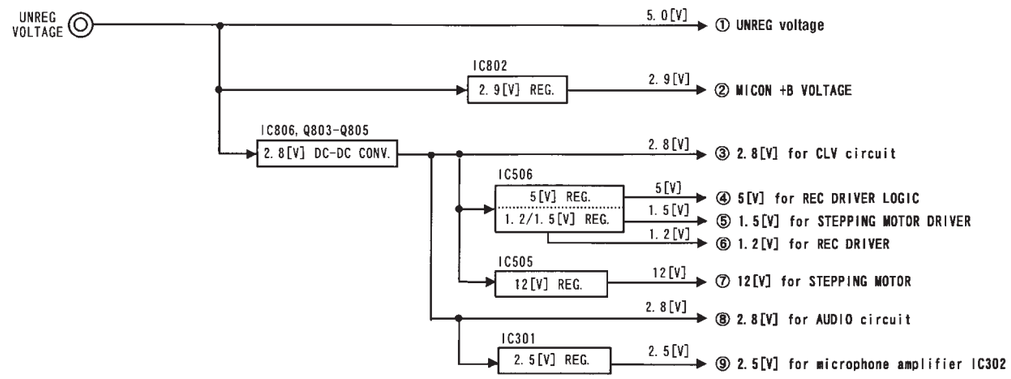


Fig. 5-1 Supply voltages generation block diagram

When MZ-R5ST is connected to station, the following nine kinds of voltage are generated by Mini Disc recorder (MZ-R5ST). (Refer to Fig. 5-1.)

① UNREG voltage → "Supplied from station"
- This is 5.0 V power that is supplied from station.
- This is 5.0 V power for the driver of the coil/motor drive IC505.

② MICON +B voltage → "RESET (2.9 V REG) IC802"
- This is 2.9 V power that is used for driving the system controller IC801.

③ Power for CLV circuit → "2.8 V DC-DC converter (IC806, Q803 to Q805)"
- This is 2.8 V power that is used in the CLV circuit (RF amplifier IC501, digital signal processor IC503, coil/motor drive IC505, etc.)

④ Power for REC DRIVE logic circuit → " 5 V REG (IC506)"
- This is 5.0 V power that is used for driving the logic circuit inside the REC DRIVE IC506.

⑤ Power for stepping motor driver → " 1.2 V/1.5 V REG (IC506)"
- This is 1.5 V power that is used as the H-bridge power supply for stepping motor.

⑥ Power for REC DRIVER → "1.2 V/1.5 V REG (IC506)"
- This is 1.2 V power that is used as the power supply for the over-write head driver during recording.

⑦ Power for stepping motor → " 12 V REG (IC505)"
- This is 12 V power that is used for the power supply of pre-driver inside IC505.
- This 12 V power that is used to drive stepping motor.

⑧ Power for audio circuit → "2.8 V DC-DC converter (IC806, Q803 to Q805)"
- This is 2.8 V power that is used for audio circuit (AD/DA converter IC303, audio gain control IC305, etc.)

⑨ Power for microphone amplifier IC302 → " 2.5 V REG (IC301)"
- This is 2.5 V power that is used to drive the microphone amplifier IC302.

The respective powers are described how they are generated.

1. Generating the UNREG voltage

When DC plug is connected to DC jack of station (MZS-R5ST), the UNREG 5.0 V power that is generated by the power supply circuit of station, is supplied to MiniDisc recorder. Refer to the power supply circuit description of station for more details.

2. Generating the MICON +B voltage

When the UNREG power is supplied to the RESET IC802 pin 6 VDD], the MICON +B voltage is generated by the step-up/step-down regulator and is output from pin 5 [VOUT].

3. Generating the Power for CLV circuit

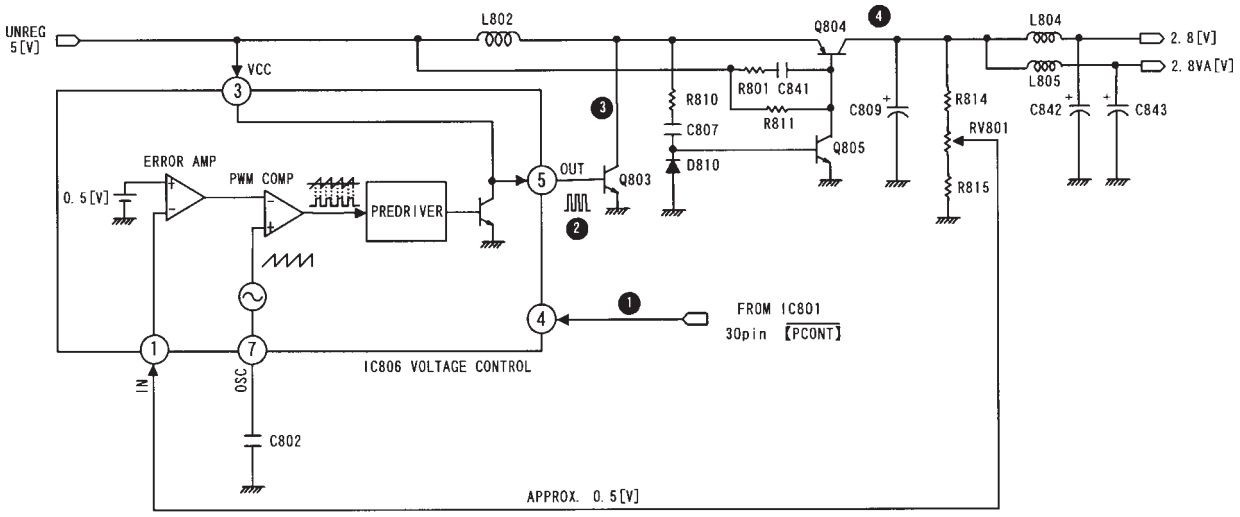


Fig. 5-2. 2.8 V DC-DC converter circuit

Fig. 5-2 shows the 2.8 V DC-DC converter circuit block diagram. The UNREG voltage is supplied to the voltage control IC806 pin 3 [VCC], and when output from the system controller IC801 pin 30 $\overline{\text{PCONT}}$ goes to "L", IC806 starts up. When IC806 starts up, PWM waveform that is generated by the internal PWM comparator is output from pin 5 [OUT].

The PWM waveform is sent to Q803, Q804 and Q805 which start switching operation, and the step-down DC-DC converter circuit starts up too. Output of Q804 is smoothed out by C809, divided by the voltage-divider resistor of R814, RV801 and R815. Output voltage obtained by the voltage-divider resistor is fed back to IC806 pin 1 [IN]. Based on this feedback voltage, IC806 controls the voltage by controlling the PWM waveform duty generated by the PWM converter inside. Thus the 2.8 V power for CLV circuit and 2.8 V power for audio circuit are generated.

The SLEEP function is described next. The SLEEP function is used in order to realize the low power consumption when MiniDisc is operated on battery such as rechargeable lithium-ion battery. When about ten seconds have passed after MiniDisc recorder enter the STOP state, IC806 is stopped of its operation by setting pin 30 $\overline{\text{PCONT}}$ output to "H". The 2.8V DC-DC converter is stopped by this "H" signal.

Fig. 5-3 shows the waveform timing of the 2.8 V DC-DC converter circuit.

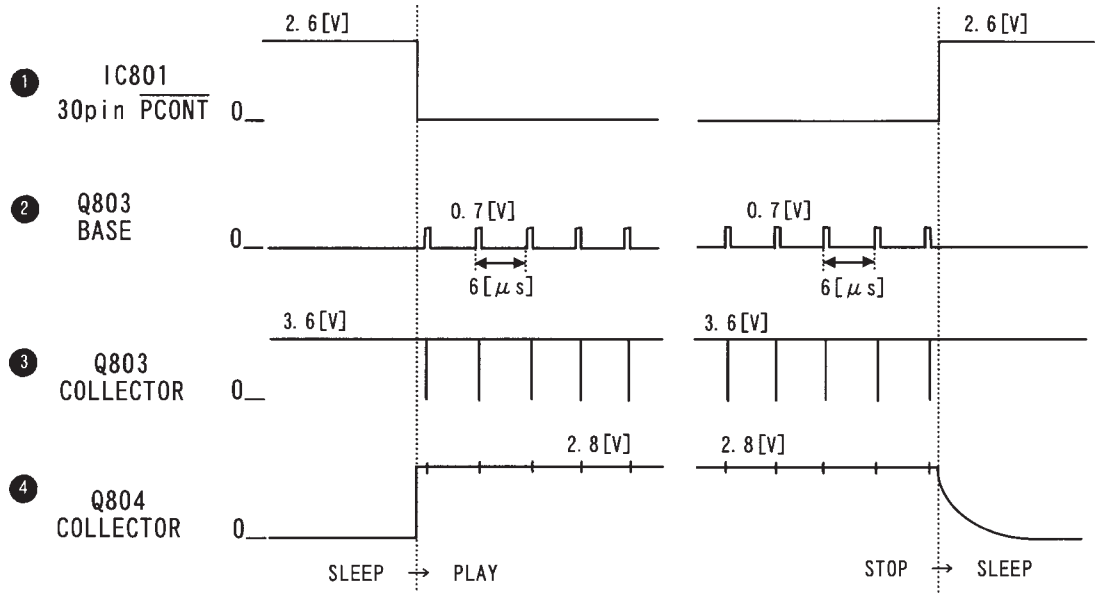


Fig. 5-3 Waveform timing chart (When MiniDisc is operated on rechargeable lithium-ion battery)

4. Generating the REC DRIVE logic voltage

5 V is generated form the CLV circuit voltage 2.8 V by the step-up converter consisting of the REC DRIVE IC506 pin 7 [VG], L514, D502 and C565. The generated 5 V is used for the logic circuit inside IC506.

5. Generating the power for stepping motor/REC driver

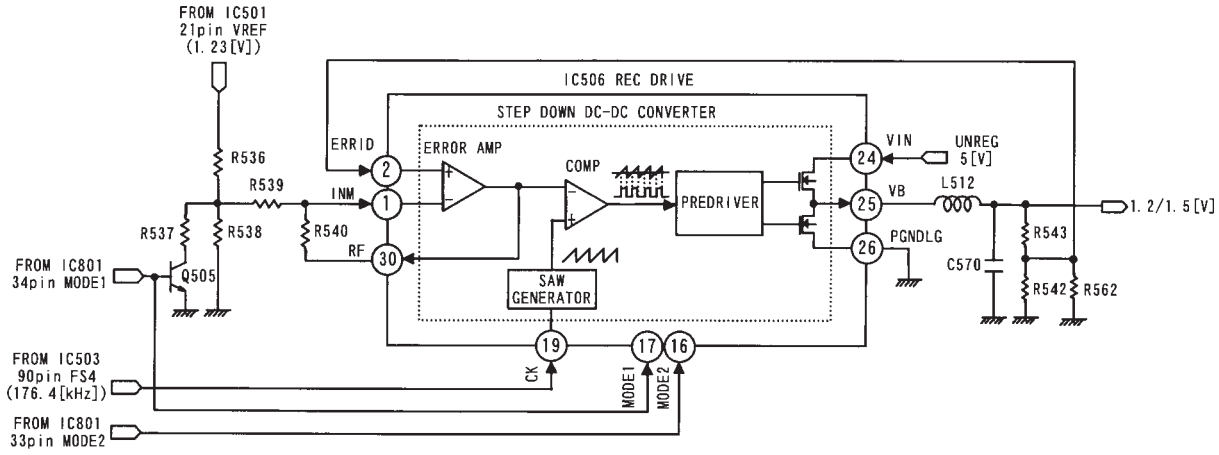


Fig. 5-4 1.2 V/1.5 V regulator block diagram

Fig. 5-4 shows block diagram of the 1.2 V/1.5 V regulator circuit. The mode setting table of the REC DRIVE IC506 is shown in Table 5-3. IC506 switches the internal operating mode according to the control signal output from pin 34[MODE1] and pin 33 [MODE2] of the system controller IC801 as shown in the table. When stepping motor is activated, the system control IC801 outputs "L" signal from pin#¢ [MODE1] and also "L" from pin 33 [MODE2]. Q505 is turned "OFF" by this "L" signal. As a result, the step-down regulator inside IC506 becomes the 1.5 V regulator, and 1.5 V is output from pin 25 [VB] of IC506.

Next, during recording mode, the system controller IC801 outputs "H" signal from pin 34 [MODE1] and "L" from pin 33 [MODE2]. Q505 is turned "ON" by this "H" signal. As a result, the step-down regulator inside IC506 becomes the 1.2 V regulator, and 1.2 V is output from pin 25 [VB] of IC506. Thus the step-down regulator inside IC506 is switched of its operation by changing the reference voltage of error amplifier as Q505 is turned on or off.
At the same time, the sawtooth wave that is generated internally by IC506, is generated based on 176.4 kHz signal which is output from the digital signal processor IC503 pin 90 [FS4].

Table 5-3 List of IC506 mode settings

MODE 1	MODE 2	STEP UP REG	STEP DOWN REG	EFM logic block	Operation mode
H	H	STOP	STOP	STOP	During STOP and PLAY
L	H	POWER ON	STOP	STOP	Not used
L	L	POWER ON	POWER ON 1.5 V output	STOP	When stepping motor is operating
H	L	POWER ON	POWER ON 1.2 V output	POWER ON	During recording

6. Generating the power for stepping motor

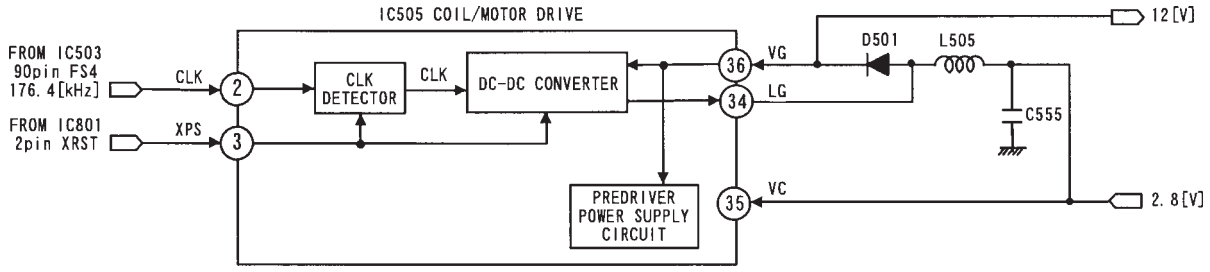


Fig. 5-5 12 V DC-DC converter circuit

Fig. 5-5 shows block diagram of the 12 V DC-DC converter. The coil/motor drive IC505 has the 12 V DC-DC converter internally in it. The 12 V DC-DC converter starts operating when coil (L505), switching diode (D501) and smoothing capacitor (C555) are externally connected. The 12 V DC-DC converter generates the power supply voltage to be used by the pre-driver inside IC505, and the 12 V power supply voltage for stepping motor. This 12 V DC-DC converter operates in synchronization with the clock (176.4 kHz) supplied from the digital signal processor IC503 pin 90 [FS4].

7. Generating the power for microphone amplifier IC302

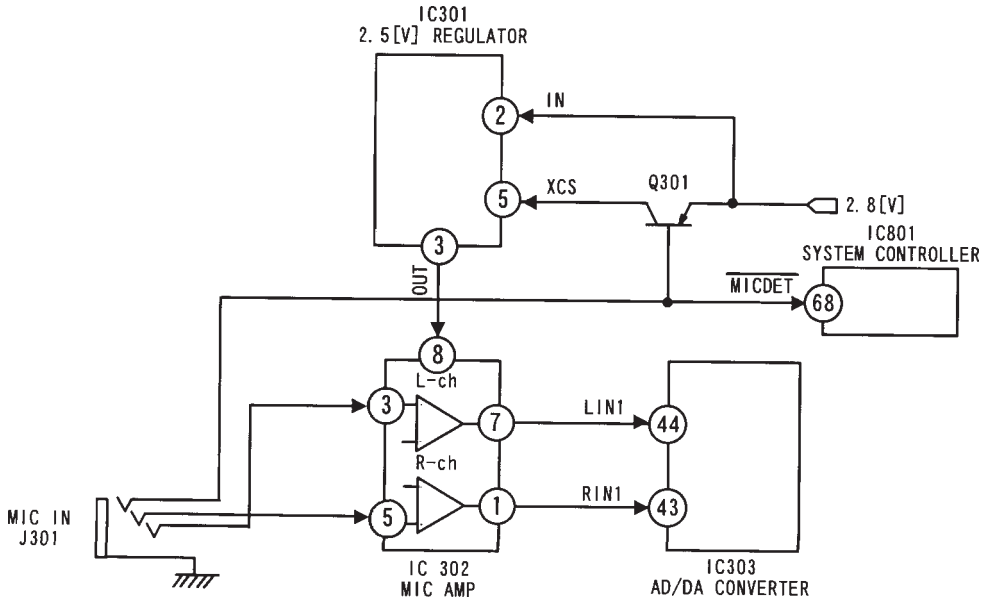


Fig. 5-6 Generation of microphone amplifier IC302 drive voltage

Fig. 5-6 shows block diagram to generate the microphone amplifier IC302 drive voltage. When microphone plug is connected to the MIC jack as shown, input to the system controller IC801 pin 68 [$\overline{\text{MICDET}}$] goes to "L". Q301 is turned "ON" by this "L" signal. Then 2.8 V is supplied to the 2.5 V regulator IC301 pin 5 [XCE] that starts up IC301. When IC301 starts, 2.5 V is generated by internal series regulator and is output from pin 3 [OUT] that activates the microphone amplifier IC302.

5-4. Theory When MiniDisc Recorder Is Operated On Battery

Fig. 5-7 shows the power supply circuit when MiniDisc is operated on battery.

1. Operation when MiniDisc is operated on rechargeable lithium-ion battery.

When a rechargeable lithium-ion battery is connected, battery voltage is applied to the RESET IC802 pin 6 [VDD] via a diode inside the dual N-channel MOS FET IC808. When IC802 is started up, the MICON +B 2.9 V is generated by the step-up/step-down regulator inside IC802. IC802 outputs the generated 2.9 V from pin 5 [VOUT] to the system controller IC801 pin 87 [VDD]. As the system controller IC801 is started up, the system controller IC801 detects whether a rechargeable lithium-ion battery is connected or not at pin 60 [LIMNT (LI + MNT)]. When the system controller IC801 detects that a lithium-ion battery is connected, it outputs "H" from pin 31 [$\overline{\text{BATTON}}$]. When this "H" signal is output, the 12 V power that is generated by the coil/motor drive IC505 is divided by the voltage-divider resistor R830/R831 to develop about 9 V that is sent to the dual N-channel MOS FET IC808 pin5 [NG2] so that the N-channel FET is turned on. Then the UNREG 3.7 V is output from IC808 pin 8 [ND2].

2. Operation when MiniDisc is operated on external battery.

When external battery such as nickel-hydrogen battery is connected, battery voltage is applied to the RESET IC802 pin 6 [VDD] via D801 to start up IC802. The RESET IC802 has the built-in power supply voltage detection circuit which maintains the VDD input voltage to 3.4 V or higher by the self step-up circuit consisting of L801, D808, C831 and the switching output of pin 8 [LX]. At the same time, when IC802 is started up, the MICON +B 2.9 V is generated by the step-up/step-down regulator inside IC802. IC802 outputs the generated 2.9 V from pin 5 [VOUT] to IC801 pin 87 [VDD]. When the system controller IC801 is started up, the system controller IC801 detects whether external battery is connected or not at pin 53 [AM3]. If IC801 detects that external battery is connected, it outputs "H" from pin 29 [XAMCN]. When this "H" signal is output, the 12 V power that is generated by the coil/motor drive IC505 is divided by the voltage-divider-resistor R825/R803 to develop about 9 V that is sent to the dual N-channel MOS FET IC808 pin 4 [NG1] so that the N-channel FET inside IC808 is turned on. Then the UNREG 3.0 V is output from IC808 pin 1 [ND1].

■ The respective voltage outputs

The power supply voltages are supplied in the same way as when MiniDisc recorder is connected to station (MZS-R5ST). Refer to section "5-3 Circuit Voltage, sub-sections 3 to 9" for more details.

◆ Technical tip ◆

The dual N-channel MOS FET IC808 has an internal diode. Because forward voltage (Vf) of this diode is above 0.7 V, it can have a case that MiniDisc cannot surely starts working when the power supply voltage is low using size AA battery or like. Therefore, D801 is installed in MiniDisc.

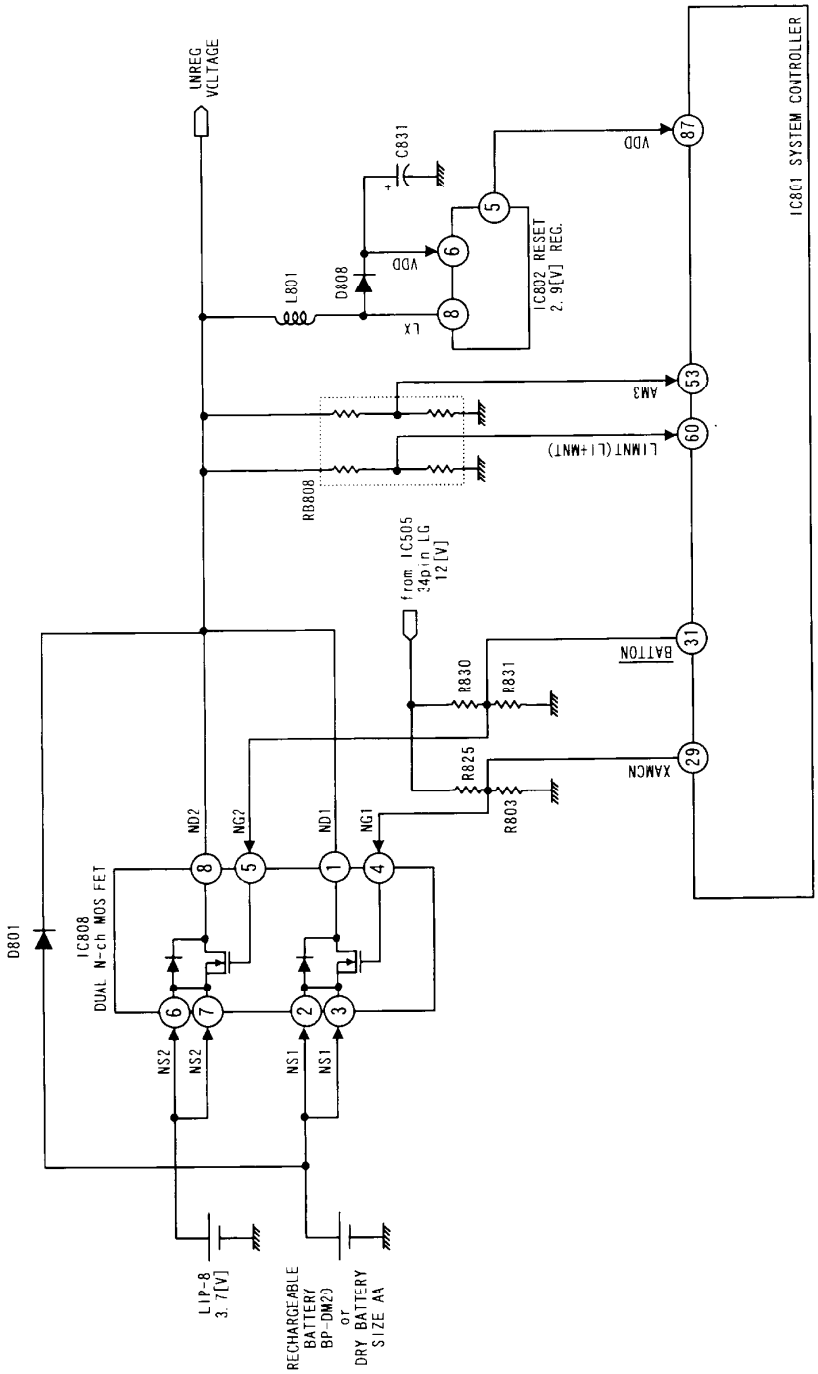


Fig. 5-7 Power supply circuit when MiniDisc recorder operates on battery

SONY

9-948-437-10

Printed in Belgium
Published by CRSE - ETS